Vol. XVIII, No. 4
October, 1961

THE UNIVERSITY
OF MICHIGAN
OCT 13 1961
ENGINEERING
LIBRARY

University of Michigan
General Library
Ann Arbor, Mich.

INDUSTRIAL QUALITY CONTROL

In This Issue

Ten Minutes With Your Top Management

The ABC's of Selecting a Small Scientific Computer

A Simplified Method for Solving Normal Equations

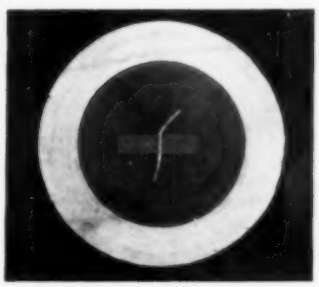
QUALITY through Scientific Methods

JOURNAL OF THE AMERICAN SOCIETY FOR QUALITY CONTROL

Model FC-14 J & L Optical Comparator

CENTRALITE adapter (arrow) slips easily into place on J & L Optical Comparator — used here to inspect tiny read/record head.

CENTRALITE image of read/record head clearly shows two magnetic poles separated by aluminum foil insulator at 31.25 magnifications.



NOW...closer inspection of micro-assemblies

...with CENTRALITE and PARABOLITE

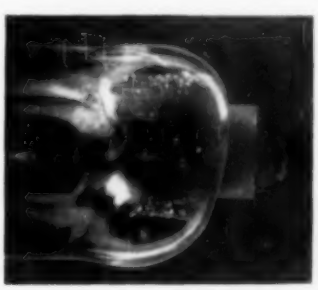
Simply slip on a CENTRALITE or PARABOLITE adapter, and your J & L TC-14 or FC-14 Optical Comparator becomes even *more* versatile. You'll use it for critical inspection jobs that may have previously seemed impossible

For example, CENTRALITE provides a highly concentrated light which now permits the projection of a precise image of a tiny read/record head used in a computer component. Light is concentrated intensely on the part and reflected back through the J & L projection system onto the Comparator screen. CENTRALITE is also used for micro-inspection of a mesa diode assembly.

PARABOLITE permits detailed examination of a tiny tunnel diode assembly by surrounding it with concentrated light. Simply by rotating the diode, you can take a close look at seal, bubble configuration at fusion points, gold contact to wafer, and other critical details.

Solve *your* inspection problems with J & L Optical Inspection Equipment. Send for Catalog LO-6013 now.

Micro inspection of this mesa diode assembly at 100 magnifications is clearly detailed with CENTRALITE.



PARABOLITE makes possible a sharp close-up of bubble configuration at the fusion point of this tunnel diode (50 magnifications).

JONES & LAMSON MACHINE COMPANY

510 Clinton Street, Springfield, Vermont

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

THIS PRODUCT EDUCATION SERVICE CARD
IS NOT VALID AFTER DEC. 31, 1961

Speedy, convenient thickness meters by CARL ZEISS

WEST GERMANY

Vertical Metroscope

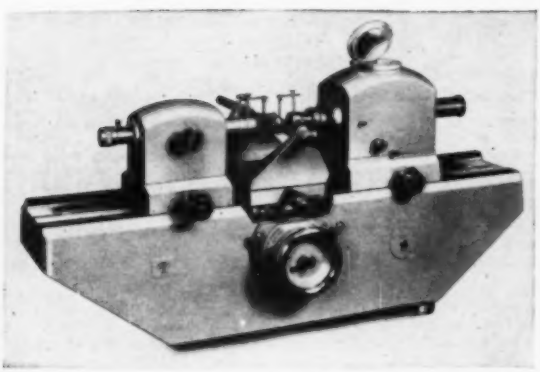
With this instrument of advanced design, direct precision measurements of heights and outer diameters can be made of parts having parallel, cylindrical, spherical surfaces, and threads (pitch diameter by the 3-wire method).

Measurements are carried out with the operator seated conveniently in front of the instrument. Low positioned, insulated switch handles prevent the transfer of body heat of operator when manipulating it, thereby assuring highest reading accuracy. Motor drive affords utmost ease in raising and lowering measuring spindle, and in adjusting the reading device.

Spindle has a 4″ glass scale, the image of which is projected into a 1¾ x 3¼″ window at a magnification of 46x. Permits convenient readings direct to .000050″, by estimation, to .000010″.

Measuring table is 6-11/16″ x 5⅛″ and has two working surfaces. One side is grooved for general measuring, while the other side has three ribs for gauge-block measurements. Auxiliary tables may be screwed into the grooved side for measuring balls, sheet metal, foil, turned parts with shoulders, etc., and for thread measurements.

Measuring unit affords a total working range of up to 8″.



Horizontal Metroscope

A universal measuring instrument for lengths up to 24″. Used for the determination of inside and outside diameters, inside and outside pitch diameters, etc. Projected scale image permits convenient readings direct to .000050″, and by estimating, to .000010″.

Write for literature.

CARL ZEISS, INC.

485 FIFTH AVENUE, NEW YORK 17, N. Y.

COMPLETE SERVICE FACILITIES

Editorial Board

IRVING W. BURR, *Chairman*
Purdue University, Lafayette, Ind.

RICHARD S. BINGHAM, JR.
The Carborundum Co.

CECIL C. CRAIG
University of Michigan

ALLEN R. CRAWFORD
Standard Oil Co. (N.J.)

HAROLD F. DODGE
Rutgers • The State University

A. V. FEIGENBAUM
General Electric Co.

ENOCH B. FERRELL
Bell Telephone Laboratories

FRANK E. GRUBBS
Aberdeen Proving Grounds

HOWARD L. JONES
University of Chicago

LLOYD A. KNOWLER
State University of Iowa

FRED C. LEONE
Case Institute of Technology

GERALD J. LIEBERMAN
Stanford University

MRS. BESSE B. MAUSS
USN, Bureau of Ships

GAYLE W. MCELRATH
University of Minnesota

MARY N. TORREY
Bell Telephone Laboratories

MASON E. WESCOTT
Rutgers • The State University

1961-62 Society Officers

President
A. V. FEIGENBAUM
General Electric Co.
New York, N. Y.

Vice Presidents
L. S. EICHELBERGER
Quality Control Consultant
Milwaukee, Wis.

A. JACK LANCASTER
AMC, Ballistic Missile Center
U.S. Air Force
Los Angeles, Calif.

GAYLE W. MCELRATH
University of Minnesota
Minneapolis, Minn.

WARREN R. PURCELL
Raytheon Mfg. Co.
Newton, Mass.

Executive Secretary
A. W. WORTHAM
Texas Instruments, Inc.
Dallas, Texas

Treasurer
R. L. FIASCHETTI
Ansco General Aniline &
Film Corp.
Binghamton, N. Y.

Junior Past President
J. Y. MCCLURE
General Dynamics Corp.
San Diego, Calif.

1961-62 Executive Directors

H. D. BIRCH
General Electric Co.
Cincinnati, Ohio

ALLIN P. DEACON
Quality Control Consultant
Brantford, Ont.

GERALD J. LIEBERMAN
Stanford University
Palo Alto, Calif.

P. S. OLMSTEAD
Bell Telephone Laboratories
Whippany, N. J.

I. W. SCHOENINGER
Globe Union, Inc.
Milwaukee, Wis.

Technometrics

Technometrics is published quarterly under the joint sponsorship of ASQC and the American Statistical Association, and is intended to serve the researcher in the physical and chemical sciences.

J. Stuart Hunter, *Editor-in-Chief*

MANAGEMENT COMMITTEE:
Paul S. Olmstead, *Chairman*
Irving W. Burr
Churchill Eisenhart
A. V. Feigenbaum
J. Stuart Hunter
Almarin Phillips
Maynard S. Renner
Harry L. Wehrly

Subscriptions should be addressed to: *Technometrics*, Box 587 Ben Franklin Sta., Washington 4, D.C.

Divisions of ASQC

Administrative Applications Division
SIGMUND P. ZOBEL
Carborundum Co.
Niagara Falls, N. Y.

Aircraft & Missile Division
ERVIN F. TAYLOR
The Martin Co.
Baltimore, Md.

Automotive Division
J. J. RYAN
Pontiac Motor Division
General Motors Corp.
Pontiac, Mich.

Chemical Division
HORACE ANDREWS
Swift & Co.
Chicago, Ill.

Electronic Division
H. DEAN VOEGTLEN
RCA Service Co.
Riverton, N.J.

Food & Allied Industries Division
MAE-GOODWIN TARVER
Continental Can Co.
Chicago, Ill.

Textile & Needle Trades Division
JAMES W. WHEELER
Canton Cotton Mills
Canton, Ga.

Industrial Quality Control is published monthly by the American Society for Quality Control, Inc. Entered as second-class matter on Sept. 18, 1950. Second-class postage paid at the post office at Milwaukee, Wis., and at additional mailing offices.

Industrial Quality Control is sent to all members of the Society as one of the privileges of membership. Subscriptions from non-members are not accepted. Subscriptions for members *only* are $3.00 of the annual membership dues. Subscriptions for company, public, and university libraries are: 1 yr.—$9.00; 2 yrs.—$17.00; 3 yrs.—$25.00; 5 yrs.—$40.00. Back issues of Vols. I-X are available at $6.00 per volume including index; Vol. XI, $9.00; XII-XV, $10.00 ea. Individual copies are $1.00 each. Microfilm editions by volume are also available. The cost per volume is: I-VI, $8.75; Vol. VII, *ff.*, $2.50 ea.

Orders for library subscriptions, back issues, and microfilm editions should be accompanied by remittance made payable to the American Society for Quality Control, Inc. *Orders under $5.00 must be accompanied by remittance.*

Industrial Quality Control is regularly indexed in the *APPLIED SCIENCE & TECHNOLOGY INDEX* published by The H. W. Wilson Company, 930 University Avenue, New York 52, N. Y.

Neither this magazine, nor any portion of it may be copied or otherwise reproduced without written permission of the copyright owner. Requests for copyright release should be addressed to the editor, Irving W. Burr. The statements and opinions given in the articles and papers in *Industrial Quality Control* are the views of the authors and not necessarily those of the Society.

Notification of address change should be sent to the secretary of your section and to the Executive Secretary's office. Allow approximately seven weeks for the change to become effective.

Executive Secretary and Publications office: Rm. 6185 Plankinton Bldg., 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin. Society's New York Address: Rm. 949B, 463 West St., New York 14, N.Y.

Address all correspondence to American Society for Quality Control, Inc., Rm. 6185 Plankinton Bldg., 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin.

Copyright 1961
American Society for Quality Control, Inc.
Printed in U.S.A. All rights reserved.

INDUSTRIAL QUALITY CONTROL

Vol. XVIII, No. 4 October, 1961

ARTICLES

5 **Ten Minutes With Your Top Management**
RICHARD S. BINGHAM, JR. **000:70:400**

The author attempts to determine what you should tell your top management about quality control to give your QC effort the push it needs to get it in swing the way you think it should be operating. How would you do this within ten minutes?

9 **The ABC's of Selecting a Small Scientific Computer**
C. E. MALEY and J. L. GIOELE **730:00:000**

This article is addressed to that large group of individuals who, knowing very little of automatic computers, yet unwillingly have some voice in the selection or approval of such a device for acquisition by their company.

14 **A Simplified Method for Solving Normal Equations**
ROBERT F. WINTER **531;532:00:000**

This article seeks to explain the basic method of solving normal equations by using the principle of symmetry, as considered by Prescott D. Crout in 1941. Worksheets for solving systems of equations having three, four, and five unknowns, have been designed in particular for rapid computation with a simple office calculator.

DEPARTMENTS

Editorial—**To Be. . . . Or Not to Be.** 4
What's New? 18
16th Midwest Conference 20, 37
330;331:60;70:400
From the Scrap Box, **Statistics Aren't Everything in Quality Control** 24
ASQC List of Committees and Organization Chart 26-30
Section Briefs 32
Chemical Division News 33
ASQC Group Insurance 36
Textile and Needle Trades Division News 39
DoALL Story of Productivity 40
Section Calendar 44
American Standards Association 1961 Catalog 45
ASQC Announces 46
United Kingdom Quality Control and Reliability Council 46
ASQC Personnel Listing Service 48
Clinics, Conferences, and Courses 49
1961 Shewhart Medal Nominations 51
1961 Brumbaugh Award Nominations 54
Consulting Services 56

EDITOR:

Irving W. Burr
Purdue University
Lafayette, Ind.

DEPARTMENT EDITORS:

C. R. Hicks, Book Reviews
P. C. Clifford, T. A. Budne, Problems
Ellis R. Ott, Practical Aids
R. A. Wylie, What's New
J. M. Juran, Management's Corner
I. W. Burr, Scrap Box
Paul A. Robert, Supervisor's Circle
A. W. Wortham, ASQC News

WEST COAST ADV. REP.

William F. Mills
P. O. Box 4002
North Hollywood, Calif.
TRiangle 7-5780

AMERICAN SOCIETY FOR QUALITY CONTROL, INC.

Managing Editor
George R. Foster

Administrative Secretary
William P. Youngclaus, Jr.

Office Manager
Jean Truettner

Room 6185, Plankinton Bldg. 161 West Wisconsin Avenue Milwaukee 3, Wisconsin

To be ....or not to be....

How many times have you asked yourself: Should I stay in ASQC or not? How many times have you answered for your friends: Why should I join ASQC?

These questions, like similar ones related to one's job, are questions that each of us must answer periodically. Such soul-searching review is essential to each person's happiness and progress. And, of course, the logical follow-up to such questions are the answers. We, who are imbued with the customary PR viewpoint, are prone to think in terms of enumerating all the tangible advantages — the more the merrier. One ASQC member, however, has put his finger on the one, intangible, but very real benefit of Society membership, and in particular, ASQC membership.

The member is Howard L. Jones, retired from Illinois Bell Telephone and now professor at the University of Chicago. His reason was given in a letter he wrote to a new member of the Chicago section. We would like to pass it on to you now and suggest that these words would be good ones to keep for reference during future soul-searchings.

August 24, 1961

George R. Foster
Managing Editor

I belong to a number of professional or scientific societies; but I don't know of one where the members do more *to help one another* than ASQC. Even members of competing companies have often helped one another get quality control programs underway . . . Many times . . . I became discouraged at the slow progress we were making with our QC program (in I.B.T. Co.). After attending a meeting of the Chicago section, I'd return to my office with new ideas and new enthusiasm that helped eventually to turn the tide in our favor.

I can also say that participating in the activities of the American Society for Quality Control has made my life more interesting and more productive. The very first meeting I attended led me to try out a sequential sampling plan on office work . . . Later, this led to an invitation to speak at a Chicago section meeting, to which I invited my boss, and then to discuss the plan with the accounting staff . . . in New York, and at a chapter meeting of the American Statistical Association in Princeton, N.J. These talks and written papers on statistics and quality control helped me later in getting acceptance of ideas about the use of process control, and finally to get an offer of a professorship when I became eligible to retire . . . It would be difficult to say just how and to what extreme, membership in ASQC has contributed to the many nice things that have happened to me, but I'm sure the contribution has been substantial.

I can't say what extent membership in ASQC will help you. In fact, I think it would be a mistake to decide whether to join or not to join on the basis of what benefits you might be able to squeeze out of our Society. Rather, I would like you to join because of the benefits you might exchange and share with others, and the possibility that it may help you to enlarge the contribution your professional life may make toward the betterment of the world in which we live. But if you join with the idea of contributing and sharing, I'm sure the reward to you personally will be substantial.

Howard L. Jones

TEN MINUTES

With Your Top Management

RICHARD S. BINGHAM, JR.

The Carborundum Company, Niagara Falls, N. Y.

If I had ten minutes of their time I'd give them an earful. I'd solve my quality problems. I'd show them that this organization needs to be changed to really put quality control on a going basis.

HOW MANY TIMES have you thought that if you could get ten minutes with your top management to talk about quality control you could really give your quality control effort the push it needs to get it in swing the way *you* think it should be? *What* would you say? *How* would you say it? To get the real feel for this situation, let's ask for the ten minutes and see what happens.

Tuesday at 10 a.m.

What are we going to tell them about statistical quality control that will help your program? Do we want to tell them that no two things you manufacture are exactly alike? Do we want to describe consumer's and producer's risks? Do we want to talk about the cost of quality? Should we tell them about the design and manufacturing costs of changing the level of quality or improving quality uniformity? Should we emphasize sound complaint analysis and the importance of quality audits? Should we pound the table about the inefficiency of 100 percent inspection as contrasted with the special advantages of sampling inspection? How about a touch on control charts and the utility of distributions? Just how much statistics do they have to know to be interested in a quality control program?

Perhaps we should take a different slant and think in terms of top management's interests. We know that among their chief considerations are profit and loss, customer acceptance of product, general product quality level and degree of duplication, plant utilization, market participation, and the continual looking at the future—comparison with today's competition and the anticipation of tomorrow's customer's need.

ASQC LCS Code 000:70:400

What does top management want to know? The president of a company or the general manager of a division is interested in potential for more profit. Is he missing something? Can he cut losses, scrap, rework, or salvage operations? Can he reduce administrative detail, speed up deliveries and get faster decisions? Our top executive inevitably wants the answer to, "Am I spending too much or too little for quality; where should I slash, or add and how?" Is the control we have now assuring uniformity? Is it consistent? Is this control system coordinated? Does the information get to Sales, Market Development, Purchasing, Manufacturing, Design, and Research and Development, as well as to Quality Control? And is it acted upon or is it just "information"?

Does top management *really* want to know this? Or would we do better to tell the executive group what we think it *needs* to know? And what would that be? Would it boil down to assurance that the control system itself is sufficient, economical and adequately flexible to meet the changing manufacturing situation?

If we take the "need to know" attitude, our plan of attack might be to stress different things. We might wish to emphasize the comprehensiveness of a sound quality control program—the "front door to back door" attitude. We might accentuate the watch words of

quality control: "prevention rather than correction," "facts vs. fiction," "evaluation rather than emotion," "control built on a probability basis" rather than "by guess and by gosh." We might describe the random nature of a control process and show that the statistical approach is the best thing that can be done.

How To Do It

The experts in advertising and promotion have put flannel boards, movies, flip charts, pop-ups, short skits, role playing and everything but dancing girls into "presentations" to top management. With this gamut to work within, there should be no difficulty in demonstrating the appropriate concepts of SQC. For example, a typical presentation might start with definitions of control as shown in Table I and then move rapidly to

Table I — Definition of Control

Check or regulate
Keep within limits
Test or verify by experiment
Exercise directing, guiding or restraining power over

(Webster 1956)

the highlights of feedback as shown in Fig. 1. How the thermostat of an air conditioner controls can be quickly described and the analogy to control chart limits made. It's not much of a jump from that to the idea of control charts themselves as shown in Fig. 2, but since quality is a rather nebulous idea it might be well to point to the possible degrees of quality found in the company's products as in Fig. 3. Having asserted that no two units of product will be identical, it may pay at this stage to demonstrate the effect of variation sources using a Quincunx, not only to show how product dissimilarities can be associated with the small residual variation found at all stages in a process, but also to indicate how shifts in process from one operating crew to another can seem to produce a more variable product than might be expected. Certainly the golden opportunity of demonstrating the output of an "out of control" process should not be by-passed since it is so easily done with the Quincunx.

The demonstration devices, of course, are only to prove points and here is a good time to show typical variability to be found in your company's products. This leads to talking about inspection. Getting the members of the executive board into the act by having them perform 100 percent inspection (by looking for such things as

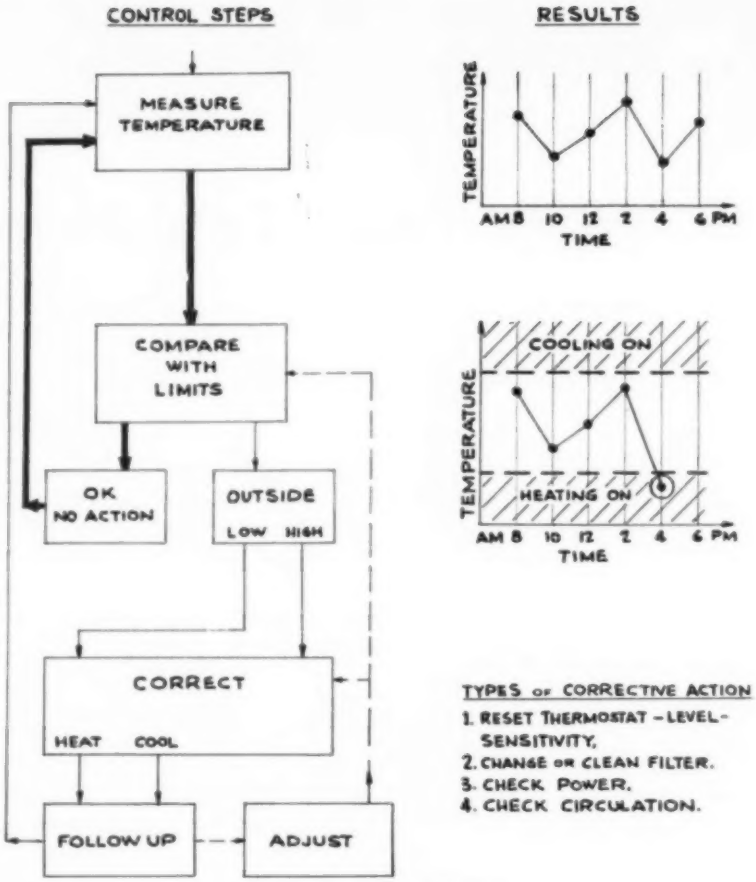


Figure 1 — Feedback Control

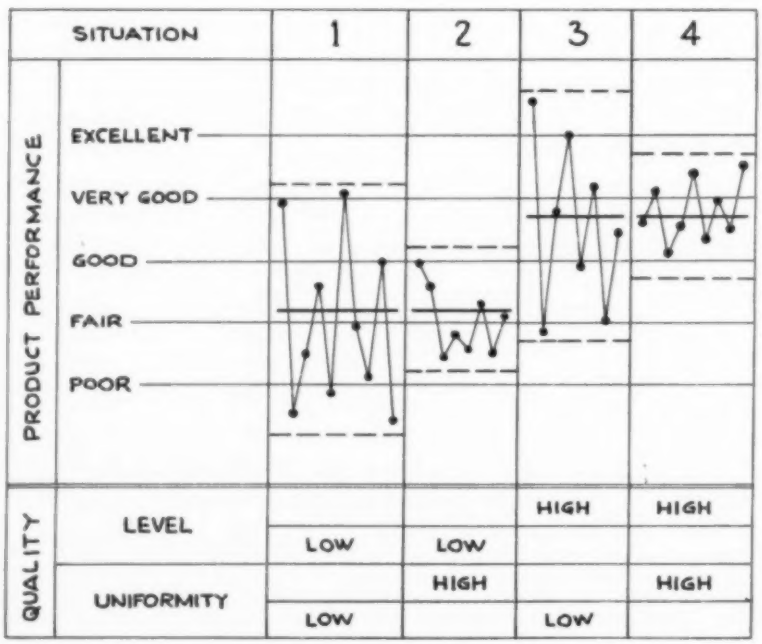


Figure 3 — Degrees of Quality

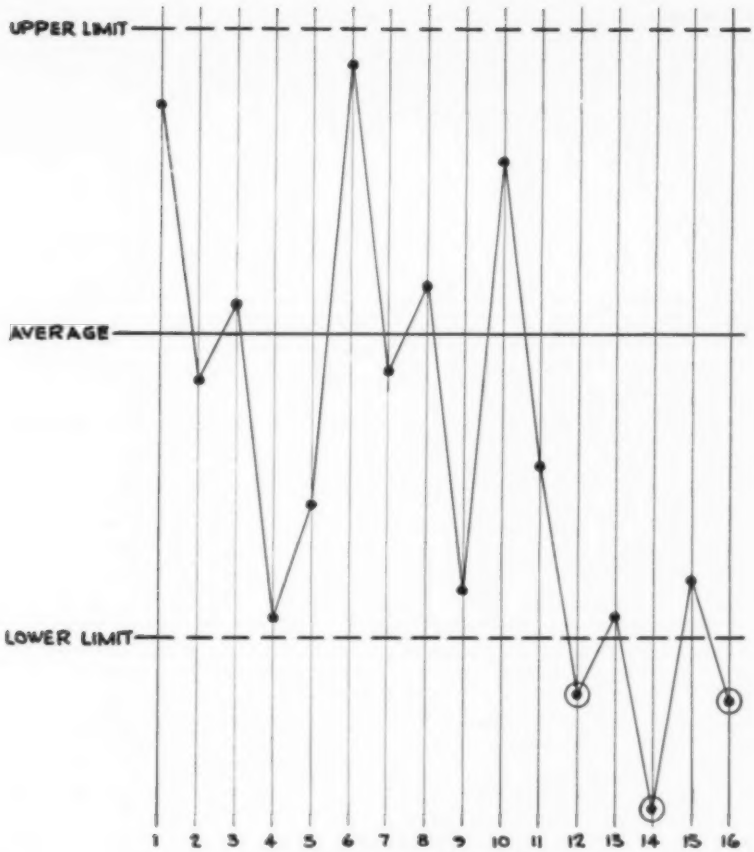


Figure 2 — Control Chart

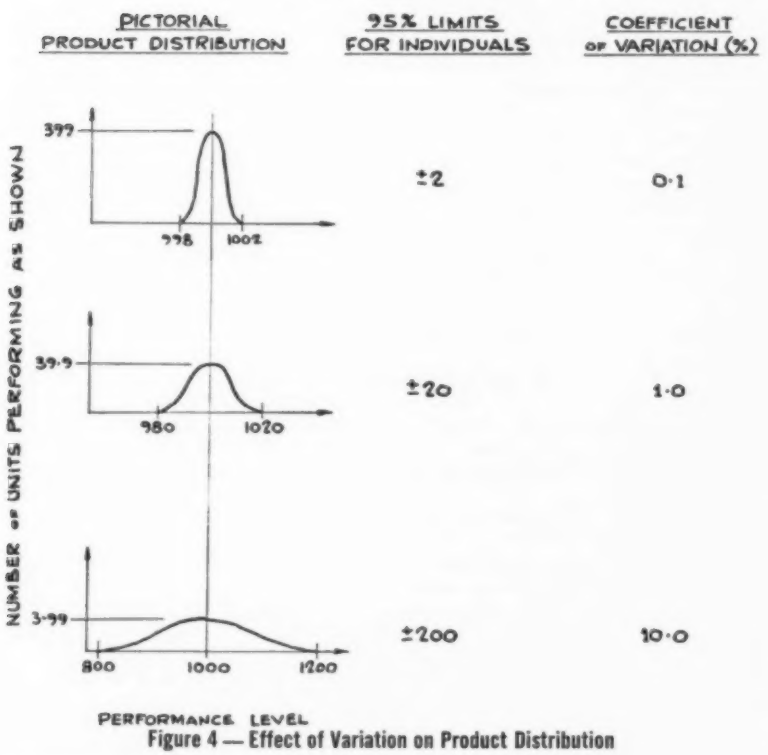


Figure 4 — Effect of Variation on Product Distribution

the number of typographical errors on a printed page) may do much to provide both a 7th inning mental stretch and a feeling for what is being discussed. Bowl demonstrations usually are then tried to show how sampling is every bit as useful as 100 percent inspection. Since much of this is academic or may seem so, it is frequently useful to throw in among all the "White beads," four or five "Red beads" or defects, *all wired together.* These, of course, can simulate the well placed or hidden defective parts that the machine operator conceals from the inspector, knowing that the inspector only reaches into the front of the tote box. Failing to find the wired together beads tends to encourage management to speak out as many of its members have felt and say "we didn't expect that sampling would do the job" and of course, it can't under these conditions. However, this provides the lecturer an opportunity to imply that quality control engineers are not as naive about production operations as might be thought and to get a sly hook in here as to the need for the proper selection of a sampling plan when defective products may be stratified.

At this stage it may be good psychology in this presentation to be more specific and re-introduce the concept of distribution again but directly related to the performance of your company's products. Figure 4 illustrates how this might be done for a product having performance at a rating of approximately 1000 units with different degrees of uniformity. The coefficient of variation approach is frequently quite powerful. For example, Table II shows the amount

Table II — Product Comparison — Ours vs. "Product X"

Number of Tests	To Show a % Difference of
55	5
15	10
5	20

(Assuming manufacturing and testing variation have coefficient of variation of five percent each.)

of testing that must be done to compare our product with product X when manufacturing and testing variation is of a given size. A handout of Table III, which contains much more detail pertinent to the same problem, allows the top managers to experiment and see how cutting back on testing variation or manufacturing variation

Table III — Number of Tests Needed to Detect P Percent Difference Between Two Items Given the Coefficients of Variation for Testing and Manufacturing

	Manufacturing Variation† (percent)														
	P = 5%					P = 10%					P = 20%				
Testing	1	5	10	15	20	1	5	10	15	20	1	5	10	15	20
1	4	28	*	*	*	<4	8	27	61	*	<4	4	8	16	27
5	28	55	*	*	*	8	15	34	68	*	4	5	10	17	30
10	*	*	*	*	*	27	34	54	87	*	8	10	15	23	34
15	*	*	*	*	*	61	68	87	*	*	16	17	23	32	42
20	*	*	*	*	*	*	*	*	*	*	27	30	32	42	55

Notes: Risk of missing a difference of P% = 5%
Risk of claiming a difference when none exists = 5%
* Greater than 100 tests each.
† $(100\sigma)/(\bar{X})$

can save money. This approach has particular appeal to sales people dealing with field testing of products. The best way to hammer home this concept is to bring in your products and show typical variabilities and the amount of testing necessary to detect a given size improvement over the existing competition. (See Table IV.)

Finally, Table V is a suitable summary for what can be expected from a control program as described above. Unfortunately, a discussion of this much detail will not be done in ten minutes, but more likely in an hour and one half, so where does this leave us?

How Not To "Sell" Top Management

Some pointers from a discussion with a top executive may be useful at this time. In a nutshell, he said, the best way *not* to get your point across to your management listeners or readers is to assume they understand your subject or talk over heads, accept any assignment that comes along, don't pay any attention to the real problem, blow the findings all out of proportion to the problem, over-dress the presentation, skip some of the people along the way that might contribute to the decision, and insist upon acceptance of your program even if it entails extra cost though there might be a slightly inefficient way to do it in parts, but paying its own way as it goes.

This experienced man expanded on some of his positive suggestions. He felt that the job amounts to "selling change"; that most managers will not buy things they do not understand, and that frequently the expert either assumes too much or too little knowledge on the part of the listener and because of this, tends to irritate him. (He assumed familiarity with the usual ideas of selling, such as, knowing the "customer," who affects decisions, knowing when to call, having some idea of prejudice for or against the ideas, and the principles of "related selling"—building up some "good will" or confidence which can be borrowed upon in the future.) It was his opinion that over-dressing the presentation could elicit a negative reaction on the part of the listener.

Since management is accustomed to operating without all the facts, it expects others to do likewise. Hence, the quality control engineer would be wise to discuss or accept assignments only when he can do well in relation to the cost both in time and in effort. In discussing specific problems, it was his suggestion that the results should be complete, concise and in direct proportion to the problem. Anything more than this reduces the confidence that the listener or reader has in the investigator.

He further suggested including more people in the discussions and sending copies of the reports to other interested executives rather than omitting them by oversight or intention. He pointed out that frequently they can add ideas for more profitable solutions and more often than not, if they find the report in a positive direction, tend to indicate their acceptance of it to their subordinates even if they themselves chose not to make the final decision.

He strongly suggested having each engineer ask himself,"*Did I make the problem more complex than it was?*", and then to seek a balance between the complexity of the material under study with the ability of the reader or listener to understand it.

Last but not least, of course, was to give the answer and not excuses.

Ten Minutes or 10 Months

With some fatherly advice as this, we may begin to ask ourselves why did we want ten minutes with our top management? Was it to ask for support or approval, was it to add to our confidence, or did we just want to display our talents; were we looking for authority or were we trying to inform? Is this the best way to put the program across—and *can* you tell them in ten minutes if you had them? If you are on the scene as a Quality Control Engineer, chances are you are living in a positive atmosphere. Isn't it better to *show* top management by performance? Certainly then, with a good record behind you, you won't have to seek them out. It will be obvious that quality control pays off.

Well, we've had our ten minutes with top management and now it is time to get to work!

Table IV — Product Variation and Test Size

Product	Coefficient of Variation (%)*	No. of Tests To Find a 10% Difference
A	4.6	7
B	6.3	12
C	10.8	30
D	11.5	35

*(Combined Testing and Manufacturing Variation)

Table V — What To Expect From Statistical Controls

1. Power to detect process shifts.
2. Low rejection of good product.
3. More uniform product by eliminating over- and under-control.
4. Better knowledge of what process machinery can do relative to specs.
5. Up-to-date product quality information.

Late Developments

As the Maley-Gioele article was about to go to press, we were informed by manufacturers that two more types of memory have newly invaded the field of small scientific computers.

The "juke box" type consists of rotating magnetic discs. These bear the same relation to the magnetic drum that the modern disc record bears to the old Edison cylindrical record; i.e., greater storage capacities and mechanical speeds.

The "stamp album" type consists of thin rectangular magnetic films "pasted" to leaves of paper. Higher electronic speeds and lower power requirements of this type are obtainable due to their much lower magnetic reluctance as compared to cores.

THE ABC's OF SELECTING A SMALL SCIENTIFIC COMPUTER

C. E. MALEY and J. L. GIOELE

The Carborundum Company, Niagara Falls, N.Y.

Introduction

This article is addressed to that large group of individuals who, knowing very little of automatic computers, yet unwillingly have some voice in the selection or approval of such a device for acquisition by their company. We think the title not misleading —ABC's assure that the treatment will be elementary. As the XYZ's are nowhere mentioned, one must not expect this to be the definitive article which, indeed, has yet to be written.

Historical Background

Computers have always been with us. They fall into two classes, analog and digital (Table I).

Analog Computer

An analog computer operates on a measuring principle such as a logarithmic or voltage scale. In this case, the continuous scale is used. That is, one never jumps from the 5 to the 6 mark; one proceeds through every possible intermediate value. The first analog computer was probably the human foot, employed to step off distances. The fact that distances almost never come out in an exact number of steps reminds one that a continuous scale is being used. A more sophisticated analog computer is the slide rule you carry in your vest pocket.

Your automobile contains an analog computer, the speedometer. If one were to take this meter apart, one would find a permanent circular magnet rotating within a "tin can" held against the zero pin by a coil spring. The faster the magnet rotates the more the tin can is dragged around its pivot.

This analog computer is rather an odd one, as it differentiates (computes the rate of change of a quantity, as distance recorded on the odometer) whereas most analog computers integrate (determine a quantity from its rate of change).

In fact, the chief application of analog computers is in the duplication or simulation of an actual or possible physical process. Hence the name "analog" since the computer is specifically designed to be "analogous" to the physical system it represents. This is ordinarily accomplished by supplying the necessary rates of change of the quantities to be computed either directly, through measuring instruments, or indirectly, through known systems of ordinary differential equations.

While analog computers have been greatly developed and are unexcelled in some applications, they are restricted to the representation of physical systems and hence are not versatile enough to be an all-round scientific computer. For this purpose a digital computer is needed so the remainder of this article will deal only with digital computers.

ASQC LCS Code 730:00:000

Digital Computer

A digital computer operates on a counting principle. Here the discrete scale is used—i.e. one jumps, as 5, 6, 7. The first digital computer was the human digits (fingers), used by the caveman to count his bag of rabbits or number of children to feed. He would have considered it odd if this count had not come out exact. This is also why we all use a decimal system. A more sophisticated example is the abacus universally used by the Oriental races.

One familiar with Greek and Latin realizes that the words 'calculate' and 'calculus' derive from the Latin

TABLE I — TWO TYPES OF COMPUTERS

	Analog Computer	Digital Computer
Operating Principle	measures	counts
Scaling	continuous	discrete
Example	slide rule	abacus

'calx', 'calcis' (limestone). But if one will then consult (as the authors did) both a Latin and a Greek professor, the full picture emerges.

It seems that the ancient Greeks always had a sandbox in the village square. Here geometric diagrams were drawn, accounts computed, etc. To compute, one simply drew grooves in the sand and employed white pebbles (made of limestone, of course) as counters, a primitive predecessor of the abacus.

Characteristics of a Digital Computer

The main characteristics of an automatic digital computer are listed in Table II.

Do these properties make it a "mechanical brain" or just a high-powered desk calculator? Properties

TABLE II — MAIN CHARACTERISTICS OF AN AUTOMATIC DIGITAL COMPUTER

1. digital calculator (counts)
2. high speed
3. remembers (memory for numbers and instructions)
4. obedient (obeys set of instructions called the program)
5. makes decisions??? (logic)

2, 3 and 4 are possessed by any robot, as an automatic lathe. Property 5 deserves to be examined in more detail. The chief and, usually, the only logical ability of these machines is to look at some number x and proceed to three different locations in its memory for its next instruction according as the number is positive, zero or negative. Is this not merely another example of obedience? It may be argued that the programmer did not know the values x would assume when he programmed (instructed) the machine. True. But was not the particular "decision" implicit in the data (values "given" to the machine)?

How Digital Computers Developed

It is always instructive to examine the developmental history of a device. The cyclometer (such as

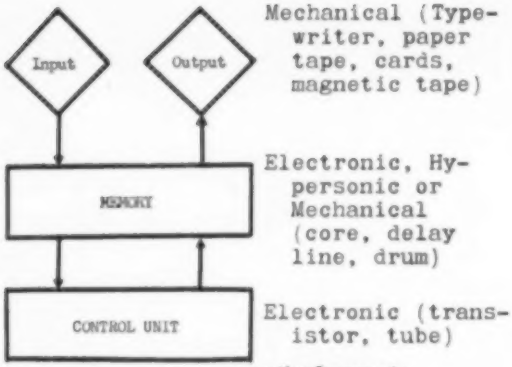


Figure 1 — Operating Components

the odometer) was invented by a Frenchman, Pascal (1623-1662).[1] He is known to all statisticians as the creator of the Pascal triangle.

As the cyclometer is the heart of the desk calculator it seems inevitable that the latter would soon be invented, as was done by a German, Leibnitz (1646-1716),[2] also inventor of determinants, the "balance of power" theory in European diplomacy and, with Newton, codiscoverer of the calculus. His calculator was, of course, hand driven.

The first automatic calculator was built in 1832 by an Englishman, Charles Babbage.[3] It was an enormous cogwheel device driven by a steam engine. Babbage not only sunk a personal fortune in it but actually convinced the British government to invest approximately $500,000 toward its development. It was based on a mathematical "differencing" principle* which is considered a good deal cleverer than the "counting" principle† in use today. There is some evidence (General Electric's Gevic and Zuse's Matrix Engine) that this principle will be returned to.

Babbage called this device the "Analytical Engine"; of course, he was right. A motor is a driving device, a machine is a driven device and an *engine is a device capable of great precision*. A card sorter is a machine, true. An automatic digital computer is more than that.

This was the first, and for 112 years, the only automatic digital computer. The second was an electro-mechanical device, the "Automatic Sequence Controlled Calculator," built jointly by Harvard University and the IBM Corporation. This was the brainchild of Professor Aiken.[5]

Evaluation of Small Scientific Computer

Operating Components

To evaluate a small scientific computer with any degree of rationality, it should be remembered that instructions and data must be fed (input) to the computer, which must remember them. The control unit must obey the instructions, and use the data, stored in memory and also store intermediate and final results into memory. The final results must eventually, of course, be put out.

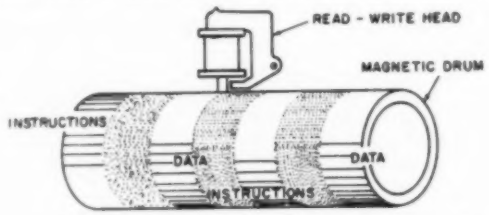
Figure 1 emphasizes that the control units of all small scientific computers operate at electronic speeds, that their input and output devices operate at mechanical speeds but that the memory device may operate at either electronic, hypersonic or mechanical speeds. At the present time this distinction is most important.

In the mechanical type of memory, instructions and numbers ("words") are stored as a pattern of magnetized dots on a rotating drum (Fig. 2a). They are obtained by the control unit as the drum rotates at high speed (say, 4500 rpm or more) under the read-write heads. Although operated at high speeds (the drum may actually float on air), these are mechanical speeds and access time (time required to read or write an instruction or number from or onto the drum) is of the order of milliseconds.

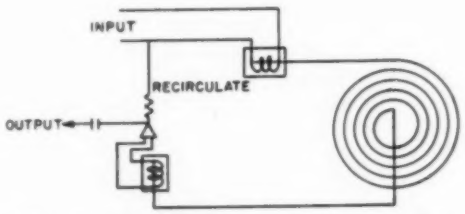
Nor is this access time a constant quantity. Obviously, if the next instruction or number required happens to lie under a read-write head, the access time will be much less than if it happened to be halfway around the drum. This has led to the expedient of "optimal programming," where the next instruction is never consecutive on the drum but rather placed where the programmer estimates it will lie under a read-write head when needed. Thus extra programming effort is required to obtain maximum efficiency from this type of memory.

In the hypersonic type of memory (Fig. 2b) one or more instructions and/or numbers are encoded as a hypersonic "echo" in a length of nickel wire. These are later read by "listening" to the echo. The principle of magnetostriction is used to create and to read the echo.

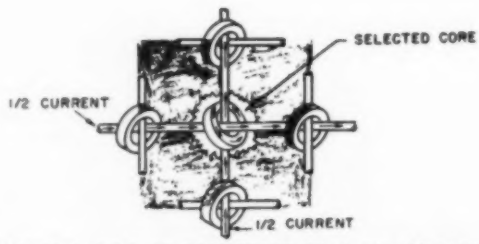
The design assures that access time will more



a) ROTATING MAGNETIC DRUM (Mechanical - Milliseconds)



b) MAGNETOSTRICTIVE DELAY LINE (Hypersonic - Milliseconds)



c) MAGNETIC CORE OR BEAD FRAME (Electronic - Microseconds)

Figure 2 — Types of Memory

*The basic number system is tensor, as the Vandermonde matrices

$$\begin{matrix} 1 & x_1 & x_1^2 \\ 1 & x_2 & x_2^2 \\ 1 & x_3 & x_3^2 \end{matrix}$$

These are generalized differencing operations. These operations reduce to multicounting (many counters in arithmetic unit). (See reference 4.)

†The basic number system is scalar, as the numbers x_1, x_2, x_3. All operations on these reduce to counting (one counter in arithmetic unit).

closely approach electronic than mechanical speed. On the other hand, when this principle is employed for the main level memory, a train of instructions or numbers are encoded in one echo and access is again nonrandom, i.e., some words may be gotten more quickly than others.

In the electronic type of memory (Fig. 2c) instructions and numbers are stored as a pattern of magnetized beads strung on a stationary frame of wires. They are obtained by the control unit as the bead frames are electronically scanned. Access time is of the order of microseconds and access is random—any word is as quickly gotten as any other.

So much for the main level memory. To complicate the picture, some computers whose main memory is low level also incorporate a few words of fast or high level storage, as one word nickel delay lines or cores. By "looking ahead," the next few instructions and data that will be needed are marshalled into the fast storage while the control unit is otherwise occupied by arithmetic or control operations. Such expedients increase the effective speed of the computer.

Computer Capacity

The capacity of an engine (the magnitude and complexity of problems that may be attempted) is determined by the number of instructions and the number of numbers (these may not be the same) that may be stored. These figures are easily obtainable from computer manufacturers. It should be noted that somewhat fewer double address instructions (if it is that type of engine) will do the same job as a certain number of single address instructions. As an example an arithmetic problem is stated as follows:

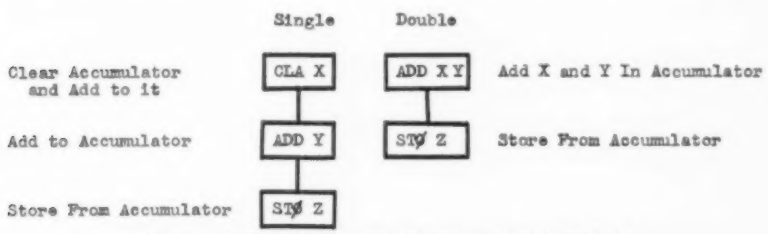


Figure 3 — Comparison Between Single and Double Address Codes

$$(Z = X + Y)$$

The number of steps required using single and double address instructions are shown in Fig. 3. Also, number storage should be measured in terms of floating point numbers.* (Fixed point numbers are used chiefly in accountancy.)

floating point numbers

$$+\,5083751274 = +\,0.83751274$$
$$= +\,0.83751274 \times 10^{10}$$
$$-\,5383751274 = -\,837.51274$$
$$= -\,0.83751274 \times 10^{3}$$
$$+\,4883751274 = +\,0.0083751274$$
$$= +\,0.83751274 \times 10^{-2}$$

*In accounting operations one may *assume* that the decimal point is fixed in a certain position, as two digits from the right (dollars and cents).
In scientific work, the position of the decimal point varies and must be specified. The "excess of 50" principle is generally used, i.e., 53 specifies that the decimal point lies *three* positions to the *right* of the normal position. 48 specifies that the decimal point lies *two* positions to the *left* of the normal position. The normal position immediately follows the specifier, as 53 or 48.

The capacity of a small computer may be flexible. Extra bead frame or drum units are sometimes available.

As an automatic computer is obedient, it must proceed at each step to memory for its next instruction (and, possibly, data). Thus, memory access time is the ultimate limiting factor in speed. This is the inbuilt design limit. Adding another bead frame or drum unit will double the capacity of an engine. It cannot change its speed.

Computer Speed

All control units operate at electronic speeds. There is, however, no magic formula for measuring their effective speeds. One large manufacturer employs the formula

$$\text{average arithmetic speed} = \frac{5 \times \text{add speed} + 3 \times \text{mult speed} + 1 \times \text{div speed}}{9}$$

However, many operations of the control unit are not arithmetic. Again, the formula assumes that a typical problem entails five times as many additions as divisions, etc. If you insist on using this formula, be sure to use *floating* add speeds, etc. You are better advised to time the complete computer on your typical problem. In this connection, built in floating point hardware (a deluxe feature) is far faster (by a factor of ten) than the floating point subroutine programs (floating point arithmetic in terms of fixed point instructions) that must otherwise be used.

Unlike memory access speed, it is possible for a manufacturer later to increase the speed of the control unit, especially if this is of modular construction (transistorized printed circuit panels that slide in and out of the unit). In this connection, some computers require air conditioning; others, especially the transistorized models, do not. This feature may assume some importance if your offices are not now air conditioned.

The inbuilt or future bottleneck in speed is the memory; the "right now" bottleneck with all computers is the input-output. These devices may be (in ascending order of speed and cost) a typewriter, paper tape, punch card or magnetic tape, all operating at mechanical speeds. The fastest of these, magnetic tape, is appreciably slower than the slowest memory (magnetic drum).

Computer Utilization and Possible Expansion

If yours is the typical organization, you are apt to find that any of the multitude of small computers on the market will handle your present needs adequately and with a plentiful reserve.

First, let's talk about that reserve. A designer strives to produce an engine the average customer cannot possibly strain. So the average customer strives for 90 percent "utilization." Let's assume that your car is capable of 108 mph and that there are 24 hours in a day. Full "utilization" requires that it produce $24 \times 108 = 2592$ or, let's say, 2600 miles

per day. When you realize that you are probably "utilizing" your car at the rate of one percent you will sell it. Also your typewriter, adding machine, and safety razor.

You either need a small computer or you don't; it's that simple, and cost should not be prorated over the users. It's overhead, and users should be welcome.

If you expect little or no growth in your computation load for some years to come, the choice is not critical in that any of a host of computers on the market would prove adequate. The procedure is simple. Select your "typical" problem, have it programmed in autocode and run on those makes and input-output modes you are interested in. Make your selection on the basis of those features (cost, ease of programming, air conditioning required, compactness, appearance, etc.) that you like. This case is more of the exception than the rule.

TABLE III — FEATURES FAVORING FLEXIBILITY AND EXPANDABILITY

1. Memory: Magnetic core rather than delay line or magnetic drum. Extra memory units should be purchasable.
2. Control Unit: Transistors rather than tubes. Modular rather than inbuilt circuits. Floating point hardware is desirable. Autocode should be presently available.
3. Input-Output Devices: Manufacturer should offer wide gamut of types.

In the more usual case a steady growth in computational load will be experienced (often exponentially explosive in the case of a first introduction to automatic computation). This will require either a succession of computers of progressively greater ability or else one model capable of growing with your organization without bursting its seams.

A number of oldline companies are very reluctant to acquire new equipment and, once leased or bought, are very reluctant to change equipment. Thus, a decision made in 1961 might come under scrutiny by a scientific user of the same basic equipment in 1975 (the example is not far fetched). At the other extreme, your company may have demonstrated its willingness to trade equipment every other year. Is this progressiveness? Or lack of foresight?

There are many good reasons (no retraining, no reprogramming, etc.) why it might be best to obtain a small (and cheap) version of a truly expandable model and let it grow with you. There is no particularly good reason for getting any model incapable of even a modest degree of expansion.

Figure 4, representing 50 percent utilization, is designed to make the typical accountant, prone to take the static view, happy. A dynamicist, as an engineer, realizes that the reserve may rapidly shrink. Unless the installation provides a plentiful potential reserve he will consider the equipment soon due for replacement.

Let us assume that your requirements are severe. You have a small computational load now. You cannot forecast future loads but expect growth. You want a computer that can grow with the load and still be considered a good performer 15 years hence. What do you look for in the present markets?

From Table III you can see that flexibility in speed can today be obtained only in item 3 but may later be available in item 2. Flexibility in capacity can today be obtained in item 1. Ultimate speed limit of the model is fixed for all time by item 1.

It should be emphasized that your own typical problem should be run on the model you are interested in and in all available input-output modes. The fastest such mode should offer a plentiful reserve although you will probably install the cheapest such that will do your present work. Item 3 will then offer additional reserve in the near future. Items 1 and 2 must be relied on to open up new reserves in the distant future.

Should you Lease or Purchase?*

Leasing provides the opportunity to shift models, in the event of a poor decision or a major breakthrough in the computing industry. A purchase is far cheaper and indicated if you have faith in your own judgment and vision. The possibility of a major breakthrough in small computer design should be heavily discounted and for these reasons:

1. It is rather late in the day of computer design.
2. The typical company is not now participating at all in the advantages of automatic computation.
3. Costwise, any good equipment in ownership will generally be able to compete with leased equipment.

It is understood, of course, that only the "main frame" and extra memory units should be considered to be purchased outright. Temporary units, as input-output devices, should be leased.

Programming and Open Shop vs. Closed Shop

As these have to do with use of the computer after it is obtained, this topic may logically end this article.

There are three modes of programming—basic, symbolic, and autocode.

Basic programming is so called because it is written in the language of the machine itself. Thus, in programming the arithmetic problem $X + Y = Z$ one asks that the number in memory cell 1386 be picked up, added to the number in cell 1472 and the sum stored in cell 1569 (Table IV). In symbolic coding the operations are mnemonic and the storage assignments are automatic. In autocoding (Math-Matic, Fortran, Algol, etc.) one tells the computer, in the simple language of English (logic) and algebra what one wants done.

Thus to evaluate

$$y = \frac{x^3 (2 + x)}{3 \cos A} - \sqrt[4]{3p}$$

for p running from 0.2 to 0.8 in increments of 0.2, A running from 0.35 to 1.05 in increments of 0.175 and

*A rule of thumb for estimating cost of leasing is monthly lease price = 1/40th purchase price

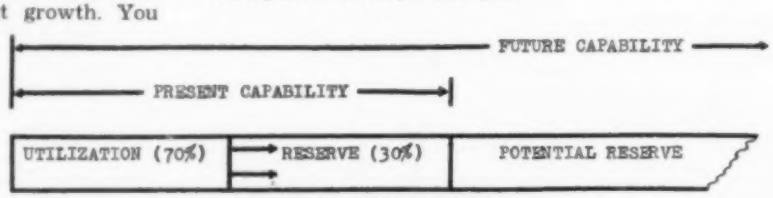


Figure 4 — Obsolescence Factor

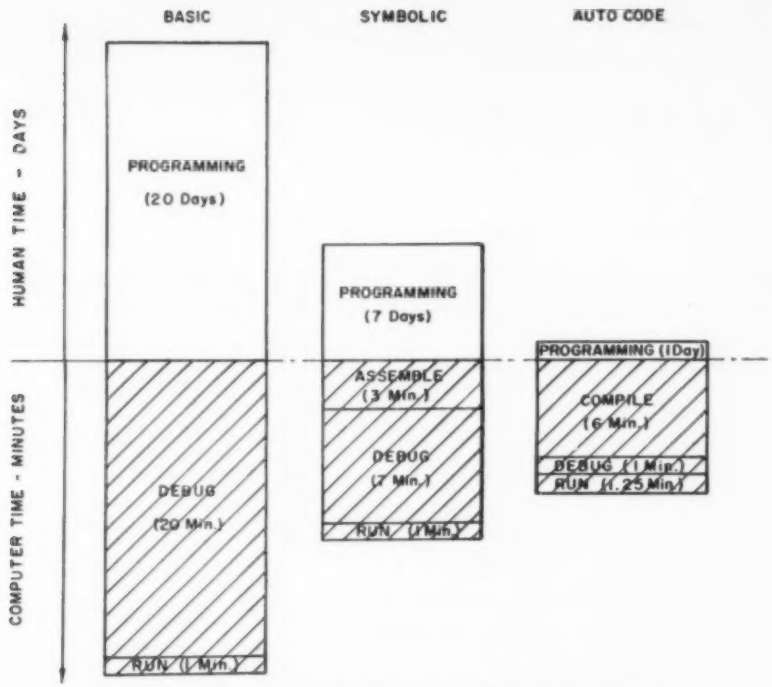


Figure 5 — Economic Comparison Among Programming Methods

x running from 1.8 to 3.8 in increments of 0.5, the complete autocode (Univac's Math-Matic) is

(1) VARY P 0.2 (0.2) 0.8 SENTENCES 2 THRU 5.
(2) VARY A 0.35 (0.175) 1.05 SENTENCES 3 THRU 5.
(3) VARY X 1.8 (0.5) 3.8 SENTENCES 4 THRU 5.
(4) Y = X³*(2 + X)/(3*CØS A) — 4 RØØT (3*P).
(5) WRITE CØNVERT TØ 3 DECIMALS Y X A P, TITLE TRAJECTØRY CALCULATIØNS, HEADINGS DISTANCE HEIGHT ANGLE PRESSURE.
(6) STØP

Economically, the comparison picture for the three types of programming is shown in Fig. 5.

If one is interested in operating with a minimal programming staff (programmers are expensive and difficult to get) and in offering an "open shop" (the engineer may program his own job if he so desires), autocoding is a "must." See that your model offers this feature.

In regard to "open shops," they are not the most efficient shops. Yet it should be realized that traditionally (until 10 or 15 years ago) the scientist and engineer has been his own computer. Until your 40 hours per week are fully utilized you may find it a good psychological investment to offer the computer to the engineer as his own personal "super slide rule" (We are indebted to Dr. Hamming for this term). You will find that he will eventually entrust the programming to professionals. But you have made a sale.

TABLE IV — PROGRAMMING X + Y = Z

basic	symbolic	autocode
XRC 1386 PDQ 1472 LKR 1560	CLA X ADD Y STO Z	Z = X + Y

Summary

To summarize, the potential buyer or leasee of a small scientific digital computer faces the task of arriving at answers to questions regarding these factors:

Design Factors

1. Input-output speeds. How fast can input be supplied to the machine and computed output be spewed out? This is of especial importance in data reduction problems.
2. Memory capacity. How large a problem, and how complex, may be attempted?
3. Computational speed. How long does it take to solve the problem, disregarding problems of supplying data and taking away the results?

Human Factor

Ease of programming. How large a staff of programmers will be required and how difficult will it be to train them?

Economic Factor

Cost. The computer can do certain things for your organization. Do these justify the cost of doing them?

Foresight Factor

Growth potential. Can the computer under consideration grow with requirements? If not, should one pay the premium price usually exacted for growth potential or simply move upward to larger computers as conditions warrant?

The economic factor is by far the most important and the most difficult to evaluate. We know but one foolproof method for doing so. Hire or have trained a programmer to run some of your problems on time rented on a neighbor's large or small computer (preferably both). This will establish your need for, and cost of, automatic computation.

The answers thus supplied may startle you. Some companies have found that it is far cheaper, by a factor of one fourth, to rent time on someone else's large computer than to lease or buy one's own small computer.

This does not mean that, after acquiring this valuable experience, none of these companies have not then proceeded to get their own equipment. Not all advantages are immediately economic.

References

1, 2. Bell, E. T., *Men of Mathematics*, Simon and Schuster, Inc., 1937, pages 79, 125

3. Morrison, P. and Morrison, E., "Strange Life of Charles Babbage," *Scientific American*, April 1952

4. Maley, C. E., "A Simplified Numerical Analysis," *Journal of the Royal Aeronautical Society*, January, 1959

5. Hollingdale, S. H., "The Application of Automatic Digital Computers to Aeronautics," *Journal of the Royal Aeronautical Society*, January, 1959

A SIMPLIFIED METHOD

FOR SOLVING NORMAL EQUATIONS

ROBERT F. WINTER

School of Commerce, Accounts, and Finance

Department of Economics, New York University

New York City

A COMMON TEDIOUS CHORE that is frequently encountered in statistical studies is the need for solving systems of simultaneous equations.

In 1941, Prescott D. Crout developed "a short method" for performing this operation.

The method, based on matrix algebra, involves considerably less effort than Gauss's or Doolittle's method, and it is significantly faster and easier than a solution by determinants.

For the specialized case of normal equations, symmetry affords a means by which the solution may be even more readily obtained.

Dr. Crout's article* considered symmetrical equations as one of several cases. However, all cases were treated from technical viewpoints rather than from practical ones.

As an aid to those who have need to solve normal equations, this article seeks to explain the basic method and to provide the reader with easy-to-follow worksheets.

The worksheets, for solving systems of equations having three, four, and five unknowns, have been designed in particular for rapid computation with a simple office calculator.

Procedure

We will consider a basic case—one consisting of two unknowns. Applying Dr. Crout's "short method," we may readily solve the equation:

$$Y = b_0 + b_1X_1 + b_2X_2$$

by using the normal equations:

$$\text{I:}\quad (\Sigma x_1^2)b_1 + (\Sigma x_2x_1)b_2 = \Sigma yx_1$$

$$\text{II:}\quad (\Sigma x_1x_2)b_1 + (\Sigma x_2^2)b_2 = \Sigma yx_2$$

where: $y = Y - \overline{Y}$, $x_1 = X_1 - \overline{X}_1$, $x_2 = X_2 - \overline{X}_2$,

and where

$$b_0 = \overline{Y} - b_1\overline{X}_1 - b_2\overline{X}_2$$

These normal equations may be rewritten as:

$$\text{I:}\quad Ab_1 + Bb_2 = C$$

$$\text{II:}\quad Bb_1 + Db_2 = E$$

It may be noted that these equations are symmetrical about the principal diagonal A — D, i.e. $\Sigma x_ix_j = \Sigma x_jx_i$.

The solution of these equations by matrix algebra may be performed by developing an auxiliary matrix.

Table I — Worksheet

STEP:	RESULT:	COEFFICIENTS:
1. $a = B/A$	$a =$	$A =$
2. $b = C/A$	$b =$	$B =$
3. $c = D/A$	$c =$	$C =$
4. $d = E - Ba$	$d =$	$D =$
5. $e = F - Ca$	$e =$	$E =$
6. $f = e/d$	$f =$	$F =$
7. $g = (G - Bc)/d$	$g =$	$G =$
8. $h = H - Cb - ef$	$h =$	$H =$
9. $b_2 = (I - Cc - eg)/h$	$b_2 =$	$I =$
10. $b_2 = g - fb_2$	$b_2 =$	
11. $b_1 = c - bb_2 - ab_2$	$b_1 =$	

ASQC LCS Codes 531:532:00:000

*Crout, P. D., "A Short Method for Evaluating Determinants and Solving Systems of Linear Equations with Real or Complex Coefficients," *Transactions of the American Institute of Electrical Engineers*, Vol. 60 (1941), pp. 1235-41

Crout has set forth a general procedure for this method:

1. The various numbers, or elements, are determined in the following manner: elements of first column, then elements of first row to right of first column; elements of second column below first row, then elements of second row to right of second column . . . and so on until all elements are determined.
2. The first column is identical with the first column of the given matrix (Equations I and II above.) Each element of the first row except the first is obtained by dividing the corresponding element of the given matrix by that first element.
3. Each element on or below the principal diagonal (A — D) is equal to the corresponding element of the given matrix minus the sum of those products of elements in its row and corresponding elements in its column (in the auxiliary matrix) which involve only previously computed elements.
4. Each element to the right of the principal diagonal is given by a calculation which differs from rule 3 only in that there is a final division by its diagonal element (in the auxiliary matrix).

Thus, to solve equations I and II above, we would perform the following steps:

1. $a = B/A$	(step 2)
2. $b = C/A$	(step 2)
3. $c = D - Ba$	(step 3)
4. $b_2 = (E - Bb)/c$	(step 4)
5. $b_1 = b - ab_2$	

The equations have thus been solved for the unknowns b_1 and b_2.

It is readily seen that the explanation of the procedure involved is far more complicated than the solution itself. By the same means that solved these equations with two unknowns, the worksheets provided in the appendix below may be used for the solution of three, four and five unknowns.

Further, it should be noted that the procedure is not limited to cases of two to five unknowns. It may be applied to *any* set of normal equations containing *any* number of unknowns. In fact, the worksheet forms, as offered here, may be applied to any series of equations, *provided* that the system of equations is symmetrical about a principal diagonal.

Table II — Worksheet

STEP:	RESULT:	COEFFICIENTS:
1. $a = B/A$	a =	A =
2. $b = C/A$	b =	B =
3. $c = D/A$	c =	C =
4. $d = E/A$	d =	D =
5. $e = F - Ba$	e =	E =
6. $f = G - Ca$	f =	F =
7. $g = H - Da$	g =	G =
8. $h = f/e$	h =	H =
9. $i = g/e$	i =	I =
10. $j = (I - Bd)/e$	j =	J =
11. $k = J - Cb - fh$	k =	K =
12. $l = K - Db - gh$	l =	L =
13. $m = l/k$	m =	M =
14. $n = (L - Cd - fj)/k$	n =	N =
15. $o = M - Dc - gi - lm$	o =	
16. $b_4 = (N - Dd - gj - ln)/o$	b_4 =	
17. $b_3 = n - mb_4$	b_3 =	
18. $b_2 = j - ib_4 - hb_3$	b_2 =	
19. $b_1 = d - cb_4 - bb_3 - ab_2$	b_1 =	

Appendix

Three Unknowns

To solve equations containing three unknowns, and of the form:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3$$

where:

$$b_0 = \overline{Y} - b_1\overline{X}_1 - b_2\overline{X}_2 - b_3\overline{X}_3$$

using normal equations of the form:

$$\text{I: } (\Sigma x_1^2)b_1 + (\Sigma x_1x_2)b_2 + (\Sigma x_1x_3)b_3 = \Sigma yx_1$$
$$\text{II: } (\Sigma x_2x_1)b_1 + (\Sigma x_2^2)b_2 + (\Sigma x_2x_3)b_3 = \Sigma yx_2$$
$$\text{III: } (\Sigma x_3x_1)b_1 + (\Sigma x_3x_2)b_2 + (\Sigma x_3^2)b_3 = \Sigma yx_3$$

where: $y = Y - \overline{Y}$, $x_1 = X_1 - \overline{X}_1$, $x_2 = X_2 - \overline{X}_2$, etc.

The constants, b_1, b_2, and b_3, may be determined by solving the three normal equations simultaneously. For convenience, the equations may be rewritten as:

$$\text{I: } Ab_1 + Bb_2 + Cb_3 = D$$
$$\text{II: } Bb_1 + Eb_2 + Fb_3 = G$$
$$\text{III: } Cb_1 + Fb_2 + Hb_3 = I$$

It will be noted that these equations are symmetrical about the principal diagonal A — H. See Worksheet, Table 1.

Table III — Worksheet

STEP:	RESULT:	COEFFICIENTS:
1. $a = B/A$	a =	A =
2. $b = C/A$	b =	B =
3. $c = D/A$	c =	C =
4. $d = E/A$	d =	D =
5. $e = F/A$	e =	E =
6. $f = G - Ba$	f =	F =
7. $g = H - Ca$	g =	G =
8. $h = I - Da$	h =	H =
9. $i = J - Ea$	i =	I =
10. $j = g/f$	j =	J =
11. $k = h/f$	k =	K =
12. $l = i/f$	l =	L =
13. $m = (K - Be)/f$	m =	M =
14. $n = L - Cb - gj$	n =	N =
15. $o = M - Db - hj$	o =	O =
16. $p = N - Eb - ij$	p =	P =
17. $q = o/n$	q =	R =
18. $r = p/n$	r =	S =
19. $s = (O - Ce - gm)/n$	s =	T =
20. $t = P - Dc - hk - oq$	t =	U =
21. $u = R - Ec - ik - rq$	u =	
22. $v = u/t$	v =	
23. $w = (S - De - hm - o)/t$	w =	
24. $z = T - Ed - il - pr - uv$	z =	
25. $b_5 = (U - Ee - im - ps - uw)/z$	b_5 =	
26. $b_4 = w - vb_5$	b_4 =	
27. $b_3 = s - rb_5 - qb_4$	b_3 =	
28. $b_2 = m - lb_5 - kb_4 - jb_3$	b_2 =	
29. $b_1 = e - db_5 - cb_4 - bb_3 - ab_2$	b_1 =	

Four Unknowns

To solve equations containing four unknowns, and of the form:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

where:

$$b_0 = \overline{Y} - b_1\overline{X}_1 - b_2\overline{X}_2 - b_3\overline{X}_3 - b_4\overline{X}_4$$

using normal equations of the form:

$$\begin{aligned}
\text{I:}\quad & (\Sigma x_1^2)b_1 + (\Sigma x_1x_2)b_2 \\
& + (\Sigma x_1x_3)b_3 + (\Sigma x_1x_4)b_4 = \Sigma yx_1 \\
\text{II:}\quad & (\Sigma x_2x_1)b_1 + (\Sigma x_2^2)b_2 \\
& + (\Sigma x_2x_3)b_3 + (\Sigma x_2x_4)b_4 = \Sigma yx_2 \\
\text{III:}\quad & (\Sigma x_3x_1)b_1 + (\Sigma x_3x_2)b_2 \\
& + (\Sigma x_3^2)b_3 + (\Sigma x_3x_4)b_4 = \Sigma yx_3 \\
\text{IV:}\quad & (\Sigma x_4x_1)b_1 + (\Sigma x_4x_2)b_2 \\
& + (\Sigma x_4x_3)b_3 + (\Sigma x_4^2)b_4 = \Sigma yx_4
\end{aligned}$$

where: $y = Y - \overline{Y}$, $x_1 = X_1 - \overline{X}_1$, $x_2 = X_2 - \overline{X}_2$, etc.

The constants, b_1, b_2, b_3 and b_4, may be determined by solving the four normal equations simultaneously. For convenience, the equations may be rewritten as:

$$\begin{aligned}
\text{I:}\quad & Ab_1 + Bb_2 + Cb_3 + Db_4 = E \\
\text{II:}\quad & Bb_1 + Fb_2 + Gb_3 + Hb_4 = I \\
\text{III:}\quad & Cb_1 + Gb_2 + Jb_3 + Kb_4 = L \\
\text{IV:}\quad & Db_1 + Hb_2 + Kb_3 + Mb_4 = N
\end{aligned}$$

It will be noted that these equations are symmetrical about the principal diagonal A — M. See Worksheet, Table II.

Five Unknowns

To solve equations containing five unknowns, and of the form:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

where:

$$b_0 = \overline{Y} - b_1\overline{X}_1 - b_2\overline{X}_2 - b_3\overline{X}_3 - b_4\overline{X}_4 - b_5\overline{X}_5$$

using normal equations of the form:

$$\begin{aligned}
\text{I:}\quad & (\Sigma x_1^2)b_1 + (\Sigma x_1x_2)b_2 + (\Sigma x_1x_3)b_3 \\
& + (\Sigma x_1x_4)b_4 + (\Sigma x_1x_5)b_5 = \Sigma yx_1 \\
\text{II:}\quad & (\Sigma x_2x_1)b_1 + (\Sigma x_2^2)b_2 + (\Sigma x_2x_3)b_3 \\
& + (\Sigma x_2x_4)b_4 + (\Sigma x_2x_5)b_5 = \Sigma yx_2 \\
\text{III:}\quad & (\Sigma x_3x_1)b_1 + (\Sigma x_3x_2)b_2 + (\Sigma x_3^2)b_3 \\
& + (\Sigma x_3x_4)b_4 + (\Sigma x_3x_5)b_5 = \Sigma yx_3 \\
\text{IV:}\quad & (\Sigma x_4x_1)b_1 + (\Sigma x_4x_2)b_2 + (\Sigma x_4x_3)b_3 \\
& + (\Sigma x_4^2)b_4 + (\Sigma x_4x_5)b_5 = \Sigma yx_4 \\
\text{V:}\quad & (\Sigma x_5x_1)b_1 + (\Sigma x_5x_2)b_2 + (\Sigma x_5x_3)b_3 \\
& + (\Sigma x_5x_4)b_4 + (\Sigma x_5^2)b_5 = \Sigma yx_5
\end{aligned}$$

where: $y = Y - \overline{Y}$, $x_1 = X_1 - \overline{X}_1$, $x_2 = X_2 - \overline{X}_2$, etc.

The constants, b_1, b_2, b_3, b_4, and b_5, may be determined by solving the five normal equations simultaneously. For convenience, the equations may be rewritten as:

$$\begin{aligned}
\text{I:}\quad & Ab_1 + Bb_2 + Cb_3 + Db_4 + Eb_5 = F \\
\text{II:}\quad & Bb_1 + Gb_2 + Hb_3 + Ib_4 + Jb_5 = K \\
\text{III:}\quad & Cb_1 + Hb_2 + Lb_3 + Mb_4 + Nb_5 = O \\
\text{IV:}\quad & Db_1 + Ib_2 + Mb_3 + Pb_4 + Rb_5 = S \\
\text{V:}\quad & Eb_1 + Jb_2 + Nb_3 + Rb_4 + Tb_5 = U
\end{aligned}$$

It will be noted that these equations are symmetrical about the principal diagonal A — T. See Worksheet, Table III.

Committee E-11 Conducts Discussion During 64th Annual Meeting, ASTM

A special session to foster intercommittee discussion of the problems of conducting interlaboratory studies of test methods and of defining the terms precision and accuracy was sponsored by Committee E-11 on Quality Control of Materials during the 64th Annual Meeting of the American Society for Testing Materials, June 25-30, 1961, in Atlantic City, N.J.

Grant Wernimont, Eastman Kodak Co., told of the present status of the Proposed Recommended Practice for Conducting an Interlaboratory Study of a Test Method, which has been in preparation for some time in Committee E-11. Several years ago, John Mandell, National Bureau of Standards, developed a theoretical model for the statistics involved, considering testing as a process. This model is the basis for the Recommended Practice for Interlaboratory Testing of Paper and Paper Products (D 1749). Dr. Wernimont had added to the statistics of Dr. Mandell and had developed a draft of a recommended practice which started with the simple case of a few materials and laboratories, developing step by step through the statistical reasoning needed to handle N materials and N laboratories. It is expected that this general recommended practice will be published by the Society as a manual something like the present Manual on Quality Control of Materials (STP 15c).

R. B. Murphy of Bell Telephone Laboratories explained the reasoning behind the proposed tentative recommended practice for use of the terms precision and accuracy as applied to a measurement of a property of a material. He explained that the term "accuracy" is considered to include the concepts of precision or small random error as well as freedom from bias. The term "precision" has to do with the closeness of individual measurements to each other; the more closely bunched they are, the higher the precision.

This concept of accuracy, while widely held, differs from that normally used by the chemist. The chemist is accustomed to considering bias and accuracy as synonymous terms. It should be pointed out, however, that the chemists in ASTM, as represented on Committee E-15 on Analysis and Testing of Industrial Chemicals, have adopted the concept of accuracy as expressed in the proposed practice, expressing the meaning of accuracy as follows: "Although the term 'accuracy' is frequently used in chemical work to express the agreement between an experimentally determined mean value and the true or accepted value, in ASTM usage this term assumes a broader meaning, combining the concepts of both precision and bias."

Dr. Murphy warned of pitfalls in using the terms "repeatability" and "reproducibility," so prevalent in many ASTM committees. He pointed out that it is not always clear from the context in which these terms are used which causes have been included in these terms. Usually, but not always, "repeatibility" appears to mean single-laboratory, multioperator-machine-day precision, and "reproducibility" appears to mean multilaboratory-operator-machine-day precision. The system of causes referred to by each of these terms should always be stated when the terms are used.

REVIEW

Quality Control

METHODS

AND

MANAGEMENT

THROUGH THE

Third and Fourth

Annual Symposium

TRANSACTIONS

These Symposia were conducted at the Drexel Institute in 1958 and at Temple University in 1959 by the Philadelphia Section, ASQC.

THIRD SYMPOSIUM TRANSACTIONS—$2.00

The Purchasing Agent Looks at Quality Control
Consumer Looks at Quality
Communications in Quality Control
Small Businesses and Quality Control
The Compatibility of Value Engineering Analysis and Reliability
The Theory Behind MIL-STD-414
A Careful Look at a Common Problem in SQC
Enhancing the Value of the QC Function

FOURTH SYMPOSIUM TRANSACTIONS—$2.00

The Design of Industrial Experiments
Quality Control Plus—A Dynamic Approach
The Correlation of Customer Requirements with Manufacturing
The Increasing Demand for Excellence
The Quality Control Manager as an Executive
Making a Multiplant Supplier Rating System Produce
The Role of QC in Industrial Competition
Army Quality Assurance

Send Your Check Or Money Order to

ASQC
161 W. Wisconsin Ave.
Milwaukee 3, Wis.

Quality Control Methods and Management

Fifth Annual Symposium Transactions

DREXEL INSTITUTE, TEMPLE UNIVERSITY PHILADELPHIA, PENNSYLVANIA

ADMINISTRATION

Quality Control Costs and the Company Budget, **ROBERT G. MITCHELL**
On Data from Samples as Legal Evidence, **DR. W. EDWARDS DEMING**

INSPECTION

To Use or Not to Use—Whose Decision? **A. A. GOODMAN**
Making and Testing of Gages, **JOHN TWINING**

TECHNICAL

Random Evolutionary Operation, **DR. FRANKLIN E. SATTERTHWAITE**

PROCESSES

Quality Control in Petroleum Refining, **D. R. CLARKE**

ELECTRONIC

Designing for Quality Assurance, **A. R. APPLEGARTH**
Field Complaint Investigation and Assessment, **T. Y. FLYTHE**

PLASTICS

Setting Specifications Statistically, **FRANCIS J. CULLEN**
Use of Computers in the Routine Testing of Plastic Materials, **W. M. CHOW, W. A. SHEDDEN, J. H. WEBB**

TEXTILE

Motion Is Not Progress, **ROBERT E. HEILAND and MAHLON R. SAIBEL**

Sponsored by the Philadelphia Section ASQC, and the Philadelphia Textile Institute

Take this opportunity to add this useful information to your Quality Control Methods and Management Library. Send your check or money order for **$2.00** to

American Society for Quality Control
161 W. Wisconsin Avenue Milwaukee 3, Wisconsin

FIFTH ANNUAL SYMPOSIUM TRANSACTIONS

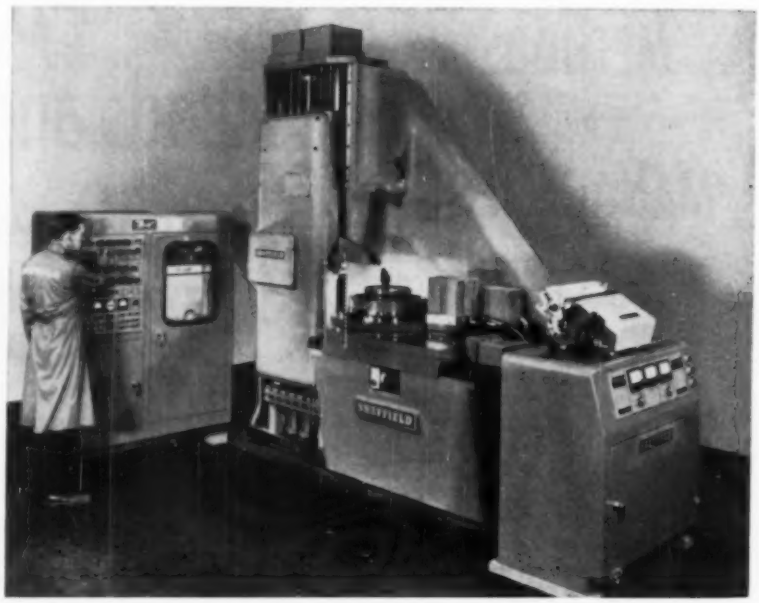
What's New?

ROY A. WYLIE, *Editor*

1001—Standard Gage Company announces a complete selection of adjustable, manual *Air Gages*. Designs which have been proven in actual use for as many as 20 years are now adapted to air. They include Standard's Bore Gages, available in seven sets to cover inside diameters from 0.123 inch to 24 inch; twelve adjustable Airsnaps cover all outside diameters from zero inch to 12 inches. Other Adjustable Manual Gages cover such types as Shallow Diameter Gages, Pitch Diameter Comparators and regular bench type Comparators. Any indicating type Gage in Standard's Catalog 35 can be supplied as an Adjustable Air Gage.

• • •

1005—A new, compact Red Ring rolling fixture type of *gear analyzer* that utilizes inertia principles and electrical indicators to provide three simultaneous precision measurements of gear tooth accuracy has been developed. The analyzer will detect nicks on tooth profiles as small as 0.0005 in. high. The inertia-type gear analyzer has a pivoted motorized master gear that is meshed with the gear to be inspected and rotated. Center distance movements of the master gear are detected by three electrical indicators to provide separate measurements of work gear tooth eccentricity, tooth-to-tooth variation and tooth oversize and undersize conditions. Measurements of the electrical indicators are transmitted to a panel unit where a red light shows a reject gear and at the same time another light shows the particular error that caused the rejection. A large dial in the panel unit gives visual indication of the eccentricity measurement. Another control on the panel permits adjustment of master gear rotating speed.



1010—The *Sheffield Universal five-axis Numerical Tape Controlled Measuring Machine, Model TC101*, is the first in a Sheffield series of automatic measurement and printout systems designed for the dimensional verification simultaneously of internal and external contour and wall thickness to millionths of an inch tolerance. While designed for the rapid, most precise measurement and inspection of spacecraft and armament components, it can also be used for commercial products. In addition to its super-accuracy and high rate of inspection speed, it is a universal measuring machine which eliminates the need for single-purpose gaging equipment and expensive fixtures which present a high cost problem with short run production and design changes. Operating automatically from instructions coded on a tape, this Measuring Machine measures and records internal and external dimensions, wall thickness and other geometrical conditions and relationships of objects of symmetry such as cones, tubes, hemispheres, etc. In addition to verifying the accuracy of parts of known dimensions, the machine also can be used to determine and printout the dimensions of a part of unknown size which is within the range of the gage. The Sheffield System includes an eight-ton one-piece gage base with movable vertical and horizontal slides, an ultra-precise rotary table, Bendix Numerical Control Unit, and a console containing the gaging and amplifying circuit, visual readout meters and automatic printout system. The rotary table, mounted on the horizontal slide, carries the workpiece holding device. The vertical slides carry the gaging stylii with the inner slide mounting the inner gage stylus and outer slide, the outer stylus. The machine has a capacity for inspecting work pieces ranging up to 20 inches high by 20 inches in diameter. Minimum inside radius of work is two inches. In order to eliminate heat generating sources from the gaging operation, the hydraulic power supply for the servo positioning control, electric panel, and hydraulic refrigeration unit are located outside of the environmentally controlled room in which the machine operates. The complete measuring system weighs 16 tons.

Nelson G. Meagley
Winner of Toledo Section's Toulouse Award

The Toledo Section has presented the Toulouse Award to Nelson G. Meagley for his outstanding achievements in the field of statistical quality control. He has long been recognized as a pioneer in advancing statistical control in the automotive industry and is a past chairman of the Automotive Division, ASQC.

Mr. Meagley is administrative assistant of quality control, Toledo Division, Continental Aviation and Engineering Corporation.

His background in the Society includes the first chairmanship of the Toledo Section.

Mr. Meagley has authored numerous papers on quality control and metallurgical subjects.

1002—Details on a special resolution *waveguide frequency meter* for use in the 7.5 to 9.6 Gc range have recently been disclosed by FXR. Known as the Model S60-13, this meter offers continuous high resolution over the entire frequency range with 1 mc as the least dial division. Accuracy of plus or minus one mc is maintained throughout the temperature range of from +32° to 85°F. FXR's Model S60-13 is a three-terminal frequency meter. At resonance there is a nominal dip of 20 percent in the power level on the main waveguide. Simultaneously, a signal 20 db down from the level in the main waveguide is fed to a coaxial crystal mount coupled to the resonant cavity. Frequency readings are taken directly for the high resolution spiral scale. The meter derives its high accuracy through use of a high Q (8,000 approx.) resonant choke plunger. A percision lead cavity tuned by a non-contacting screw drives the tuning plunger and the spiral frequency scale simultaneously.

* * *

1006—A more accurate method of calibrating flowmeter systems has been developed by Rocketdyne, a division of North American Aviation, Inc. The Rocketdyne development which has an accuracy greater than any other method now in use, has been named the *Volumetric Flowmeter Calibrator*. The device is a combination of pressurized supply tank, test and flow control station, volumetric standpipe and return unit and a control and recording unit. It can be used by laboratories for routine calibration of flowmeters or as a research tool in measurement of liquid flow. Calibration is effective over wide ranges of pressures and flow rates of liquids.

* * *

1009—The Van Keuren Company announces a new trademarked *HYT Size Gage* in the 12 inch size which will measure from a range of 0.250 inch to 12 inches, accurate to 0.000050 inch on any measurement. The ability to set any dimension to 0.0001 inch steps from 0.250 inch to 12.000 inches enables the operator to set exact dimensions accurate to 0.000050 of an inch, and eliminate the need of wringing gage blocks. A spring loaded non-rotating measuring column is made up of a series of 0.250 inch and 0.750 inch spacers lapped to gage block accuracy. Since the 0.250 inch spacers are lapped flat and parallel, the inspector can take readings from either the top or bottom side of the spacers. Due to spring loaded construction of the measuring column, all chance of backlash is eliminated because the pressure in the measuring column is equal at either end of the 1.000 inch travel of the micrometer screw. Three and six inch riser blocks, and 18 and 24 inch transfer stands are available as accessories.

WORLD'S MOST ACCURATE OPTICAL DIVIDING HEAD

VINCO GUARANTEES the Optical Master Inspection Dividing Head to be accurate within ± 1 second of arc; the ball bearing spindle runout to be 25 MILLIONTHS of an inch, total indicator reading; the master disc graduations to be spaced to an accuracy within ± ½ second of arc.

Shown above is a heavy duty dividing head and a dual recorder console with a ball slide electronic indicator stand. This ultra precision equipment will check and record tooth to tooth errors and accumulated errors to within 50 millionths of an inch on a 15" D.P. gear. Single recorder consoles are available.

DIVIDING HEAD APPLICATIONS

- Inspection of missile guidance system components.
- Measurement of gear and spline spacing and bore relationships.
- Calibration of index plates, involute and master involute profiles.
- Calibration of lead bars or helical precision components.
- Inspection of two and three dimensional cams as well as ellipses, cycloids, etc.
- Measurement of angular transmission of motion by gears and gear trains.
- Measurement of angular displacement of turntables.

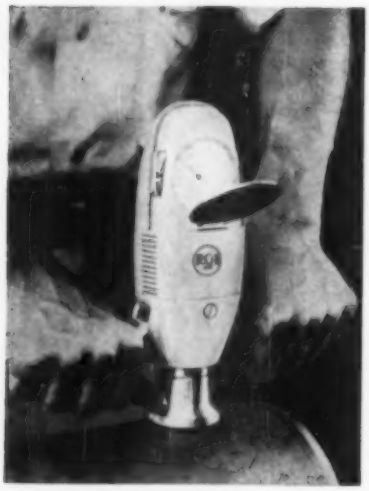
SEND FOR THIS FREE EIGHT PAGE BROCHURE. THE DIVIDING HEAD IS FULLY ILLUSTRATED AND EXPLAINED.

A 720 TOOTH, 32 D.P. 14½° P.A. PRECISION GEAR

Tolerances on this 22.500" P.D. gear are .0002" involute profile; .0003" T.T.E.; .0006" T.C.E. The same craftsmen who build the world's most accurate dividing head produce gears of even closer tolerances daily for use in missile guidance systems, jet aircraft, instrumentation or wherever needed. **Call Vinco on your sub-contract requirements.**

VINCO DIV., VINCO CORP.

9111 SCHAEFER HIGHWAY • DETROIT 28, MICHIGAN

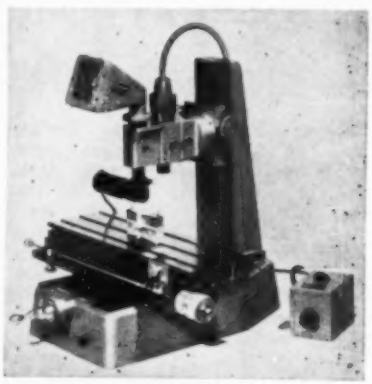


1007—A new *portable hardness tester* can be used as a standard bench-type unit for inspecting small parts. Removed from the stand or frame, the main body can be equipped with hand grips and used to check the hardness of large objects, even those with complicated contours. Readings are given in both Vickers (40-1000) and C scales (20-70). In addition to steel, this instrument can be used to check soft metals such as aluminum or copper whose thickness is more than 0.6 mm. Overall height with stand or frame is 10½ inches. Standard accessories include a flat anvil, V-anvil, inclined bed and gage, and an indenter adjusting tool. A U-shaped clamp and other accessories for use in testing the inside surface of parts such as cylinders are also available. Cost of this unit, including hand grips is approximately $495.

* * *

1008—A new unit for phase angle measurement with accuracy approaching ±0.1° is now available. The new *Model 526D Phase Unit* is designed as a plug-in for the Hewlett-Packard Models 524B/C/D Electronic Counters. It equips the counter to measure any lead or lag phase angle between two signals in the one cps to 20 kc range. For frequencies from 396 to 404 cps, an X 3600 frequency multiplier provides readings direct in tenths of degrees. At other frequencies, readings are presented in time units, with a resolution of one microsecond for full frequency range. Two highly stable trigger circuits in the Model 526D provide pulses to open and close the signal gate of the associated counter. Trigger level controls on the front panel permit accurate setting of trigger points to the zero-crossing of each signal without auxiliary equipment. Compensated input step attenuators permit phase angle measurement of signals ranging from five to 120 volts rms with full specified accuracy. Model 526D offers either ac or direct coupling and has an input impedance of one megohm. Measurement accuracy of the Model 526D is $\pm$ 0.1° $\pm$ (F_p/F_c) $\times$ 360°, where F_p is the frequency of the phase-measured signal and F_c is the counted frequency (assuming noise is 65 db below signal, and counted frequency error is negligible).

* * *



1003—*Linearscope*, a new large capacity optical measuring instrument, provides interchangeable microscope or projection screen optics. Featuring an extremely long travel precision coordinate stage, the instrument provides for accurate measuring of large parts previously difficult to check by any method. In addition, many difficult measurements, such as on internal diameters, checking the depths of internal grooves, and measuring internal radii and finishes become simple. Measuring capacity of the Linearscope is four by twelve inches in one setting. Direct micrometer read-outs are 0.0005 and 0.0001 inches . . . with the "tenth" readings in the longitudinal (12 inches travel) direction. In addition to the regular 20× or 40× monocular microscope eyepiece with crosshair reticule and integral vertical illumination, three by three inches projection viewing screen with separate high intensity illuminator is available for rapid production checking. The projection optics range from 5× to 50×. Three dimensional stereo and zoom optics may also be supplied for special applications and close visual inspection of chambers, blind holes, internal diameters and surface conditions.

St. Louis to Host 16th Midwest Conference October 19-20 at Chase-Park Plaza Hotel

Nearly 500 quality control personnel from many states and industries are expected to attend the 16th Midwest Conference of the American Society for Quality Control, Oct. 19-20 at the Chase-Park Plaza Hotel, St. Louis, Mo.

The conference, with the theme, "The Universality of Statistics," will afford them an opportunity to hear experts in their own and other fields describe varied uses of statistics.

The conference will start off with a talk by Professor Ralph G. Nichols, University of Minnesota, on "the Art of Listening." Professor Nichols will present some real practical techniques on "How to Listen" which the Conferees can apply to the rest of the Conference technical sessions.

The technical program will include basic and advanced presentations and the application of statistics in gambling, baseball, warfare, crime, medicine, stock market and weather.

October 19 What's Behind Experimental Design, Richard S. Bingham Jr.; Vendor-Vendee Relationships, Otto F. Hunziker; Frequency Distribution Analysis Sheet, Ervin F. Taylor; Fractional Factorial Experiments, J. D. Hromi; Computerized Quality Control, George M. Cohan; Ball Parks and Home Runs, Robert H. Kingsley.

October 20 Basic Probability, Dr. E. C. Yehle; Process Machine Capability Studies, Irvin A. DeGrote; Customer Complaints, Dale A. Cue; Gambling Casino Statistics, Charles C. Hirsch; Quality Control and Cost Reduction, Harmon S. Bayer; Statistics and Crime, Dr. Arthur C. Meyers; Computer Controlled Processes, Theodore Williams; Game Theory, Prof. L. H. Krone; Transformation of Variables, Allan W. Dickinson; How to Use a Consultant, Dr. Gayle W. McElrath; Statistics in the Stock Market, Alan Greenspan.

Training courses to be offered include: Basic Quality Control, George W. McDermott and Edward J. Oakley; Advanced Quality Control, Dr. Charles R. Hicks and Dr. Gayle W. McElrath; Reliability, Dr. Waldo A. Vezeau and Dr. Dirk van der Reyden.

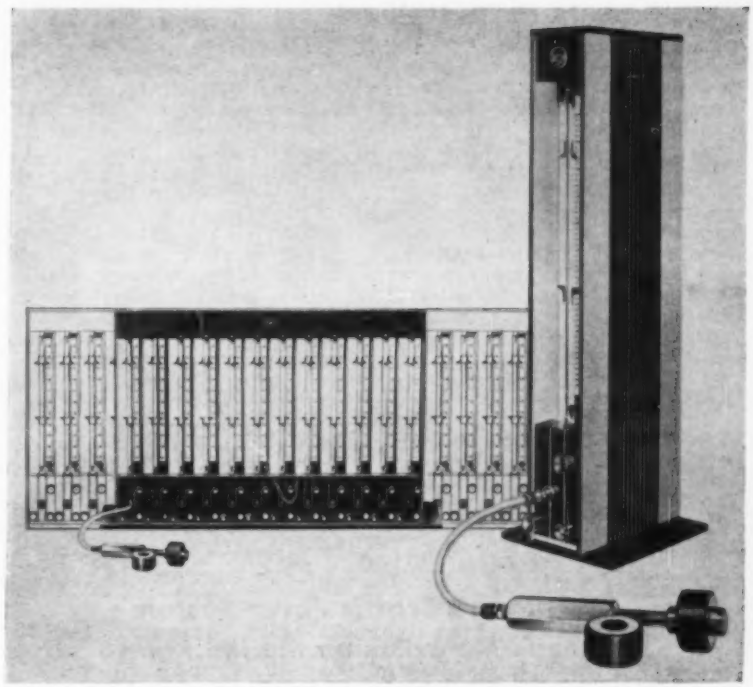
Sessions on ASQC Section Management will also be held. Topics include: The National Sectional Relationship; Officers' Responsibilities; the Saddoris Award for Sectional Management; and special study groups on program, memberships and promotion.

See page 37 of this issue for registration blank.

1004—RCA has recently announced the availability of a new *air gage* for use in bench-type operations and as components of automatic inspection systems. One of its features is the ease and compactness with which these units can be grouped into multiple systems that can be expanded at will and at minimum cost. Four ranges of amplification are provided with ten inch linear scales and a complete line of tooling is available for gage use. The tubes are spring loaded for ease of change. Floats are captive in the tube and cannot drop out. As an added convenience, the individual columns are designed so that spare tubes and scales can be stored within the case.

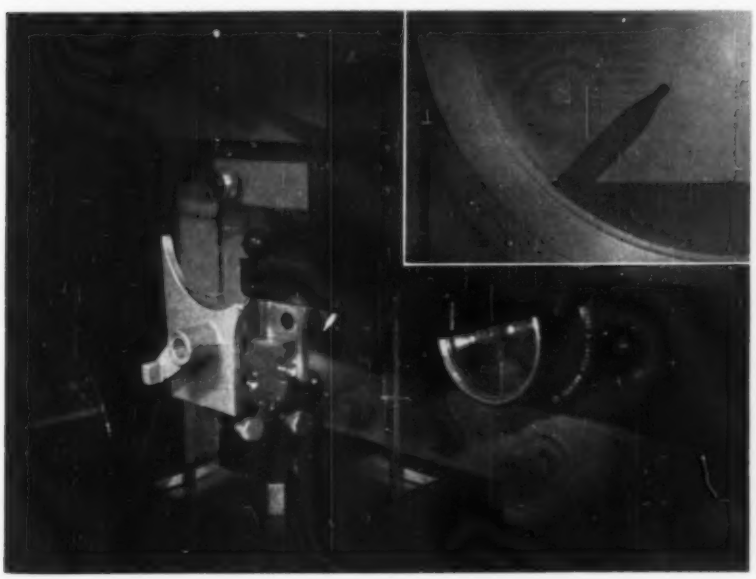
* * *

1011—Inspection of irregular contours on a complex part is easily accomplished at minimum cost and time at General Electric Co., Missile Production Section, Burlington, Vt. Measurements are accomplished through the system of Optical Projection on a *Jones and Lamson 30 inch Model FC30 Comparator.* Irregular contours are traced with a Jones & Lamson Universal Tracing Device employing Ball Stylii. A special chart gage is drawn on a 30 inch frosted glass screen. Minimum and maximum tolerance lines are outlined at ten power magnification. A special semi-pneumatic/mechanical staging fixture is used, with a setting master, to position the part. The legend and sequence of operations are printed on the screen. Once the chart gage has been properly aligned with the setting master, cradled in the staging fixture, the part is then positioned in the fixture and the dimensions are traced. The particular part inspected has a total of 18 dimensions to be checked. This is accomplished on four indexes in approximately eight minutes. The inspection of these dimensions by conventional methods would require 4.5 hours.



New Literature

1031—The complete line of Tinius Olsen two screw and four screw Electromatic Universal Testing Machines is described in 36 page *Bulletin 63* just released by the Tinius Olsen Testing Maching Co. Details and specifications are given on standard split cabinet electro-mechanical units in capacities to 1,000,000 lbs. as well as XY units for specialized research / development testing, and other models and a complete line of recorders, related instrumentation and accessories.



1032—A new, four page brochure titled *Dynamic Radar Simulators* describing the reasons for dynamic testing of radar, what it is and what it can do, is now available from Remanco, Inc. A list of general specifications is also provided as an aid in determining parameter limitations for radar simulators.

* * *

1033—The Gevaert Company of America, Inc., has just released a 25 page illustrated *handbook on industrial X-Ray films* marketed by Gevaert. The booklet contains comparison tables of the five Gevaert Structurix industrial X-Ray films, technical data and sensitometric curves on each of the five films. The handbook also contains charts showing suggested exposures for magnesium, aluminum, steel and bronze, along with exposure charts for cobalt 60 and iridium 192 with steel. In addition, there is also a section on processing X-Ray films, charts showing film sizes converted to square footages, and a table of common logarithms.

* * *

1034—*Electronic Information Searching*, a free, eight page brochure, describes American Society for Metals' new electronic system of searching technical articles, documents and patents on metals and related subjects for specific mention of any aspect of the subject. Discusses the mechanized way to reduce research costs and "time lag" between conception of an idea and production of the finished product. Shows how subscribers may receive,

every two weeks, information on anything published during the preceding two weeks on their field of interest. Explains use of new GE-225 "electronic librarian" that searches through technical articles at the rate of thousands per hour.

* * *

1035—For those interested in research, development or quality control, a new eight page *comprehensive listing of 1239 physical testing machines* for all industries obtainable from one source is now available. The equipment has been compiled from world-wide sources, including units manufactured by Testing Machines Inc. and many other prominent instrument and testing machine manufacturers.

* * *

1036—New eight page *catalog* from Daystrom, Inc., Weston Instruments Division, lists a full line of portable units, with complete data on models, accuracies, ranges, features, and prices. Among the many types of portable test units listed are matched ac and dc industrial meters, a portable current transformer for use as an ac multiplier, highly sensitive dc portables especially suited for laboratory needs, and multi-purpose industrial instruments including a power analyzer and an industrial circuit tester.

* * *

1037—A six page *illustrated catalog folder* describes two models of the Surfindicator, a portable instrument for measurement of surface microfinish on metal, plastic, glass or other materials regardless of shape or composition. Featured is the new self-powered Surfindicator MS-1000 which weighs less than six pounds and operates independently of electrical outlets. It can be connected to an oscillographic recorder to produce written records of surface profile with an accuracy of one-tenth microinch. Also shown is the standard Surfindicator Model BL-110, which operates on 115 volt plant power and can be fitted with a variety of adapters to permit measurement of hole bottoms, cutting edges and minimum-access points.

* * *

Inquiries for the following new literature may not be addressed to Product Education Service. Requests for literature and payments, when required, should be sent to the companies listed below.

* * *

American Management Association has distributed the *1961-62 Management Bookshelf* to its membership. The AMA Management Bookshelf is the annual catalog of all books, periodicals, and films produced by the American Management Association. Any interested executive may receive a complimentary copy by requesting one on his business stationary from American Management Association, Inc., 1515 Broadway, New York 36, N.Y.

* * *

General Industrial Company has started production on a handy *Circular Slide Rule* for engineers and for other plant and office executives. Any executive who must perform simple calculations will find this convenient, pocket-size calculator extremely useful in his work. For your free Circular Slide Rule write on your business letterhead to General Industrial Co., 1788J Montrose Ave., Chicago 13, Ill., and be sure to mention the name of this magazine. To those of our readers who do not qualify as an engineer or other business executive to receive a free slide rule, General Industrial Company will be pleased to send one for 50 cents.

* * *

Trig, log, antilog, and log of trig functions six place tables are all included in a compact *Vest-Pocket Library Book* (2⅝ by 5⅝, 192 pages). Beside the tables, there are eight pages of formulas, eight pages of interpolation, and other pages of valuable information. Retail price—$1.00. Available at book, stationery, and department stores. Inquiries may be sent to Ottenheimer Publishers, Inc., 4805 Nelson Avenue, Baltimore 15, Md.

* * *

A new American Standard for slotted head miniature screws threaded in conformance with an existing American Standard for unified miniature screw threads has been approved by the American Standards Association. Designated *American Standard Miniature Screws, B18.11-1961*, the standard establishes four head types, for slotted head miniature screws, their dimensions and lengths. The screw threads are in conformance with the existing "American Standard Unified Miniature Screw Threads, B-1.18-1958." Price is $1.00 a copy.

Michigan's Traffic Pacer System Speeds Motorists on Mound Road

A new Traffic Pacer system advises motorists by lighted speed signs how fast or slow to pace themselves to arrive at the next traffic signal when it is green.

The system has been installed along four miles of Michigan's Mound Road—from Eleven to Fifteen Mile roads. It was developed by General Motors Research Laboratories in cooperation with Macomb County Road Commission.

Purpose of this prototype installation is to improve traffic flow over suburban and city streets with intersections, as contrasted with limited access roads, and it is designed to move vehicles in an orderly uninterrupted run from Eleven to Fifteen Mile roads.

This is done with a series of illuminated speed advisory signals hanging over the center of the pavement. These are numerals 20 inches high resembling football or baseball scoreboard numbers. A motorist entering the four-mile system at either end or from any intersection in between needs only obey these speed signals which vary from 25 to 45 miles per hour. They inform him how fast he must go to make the next green traffic signal.

For a two-year period the system will be operated by Macomb County Road Commission. During the first 12 weeks men from Michigan State Highway Department will make traffic counts along the four-mile route. Their surveys will determine what trip time savings motorists can make and what improvement can be made in Mound Road's "intersection capacity"—the number of vehicles that can go through an intersection during each green cycle of a traffic light. The Traffic Pacer is designed to increase this capacity by as much as 20 percent.

County traffic engineers intend to evaluate the Traffic Pacer's efficiency in comparison with a conventional progressive traffic control system, now in use on many city and suburban streets, and a non-interconnected system which is presently used along Mound Road.

Main difference between the Traffic Pacer and a conventional progressive traffic control system is that the Traffic Pacer keeps the motorist continuously informed as to how many miles an hour he must go to avoid red signals. In a progressive system the motorist knows only that the traffic signals are set at a fixed speed, but if he gets out of step he has no idea how much he must vary his speed to make the next green signal.

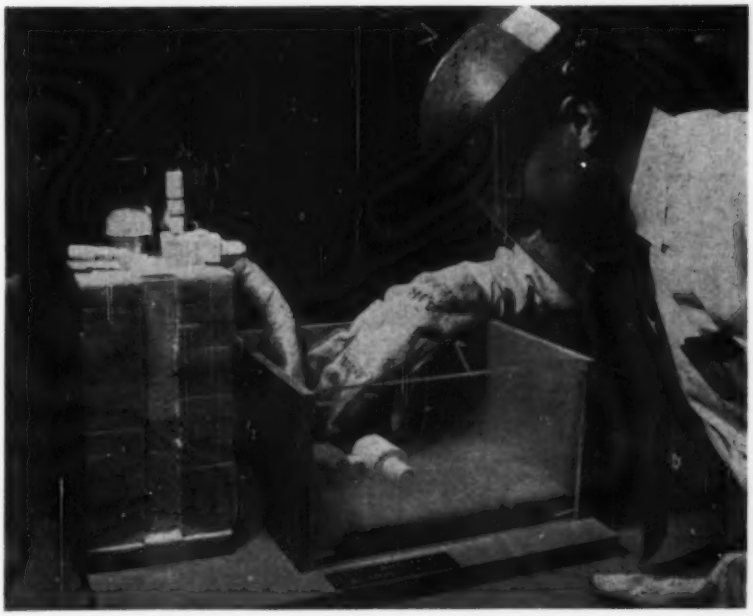
In introducing the Traffic Pacer, engineers warned it isn't a panacea. Failure to obey the speed advisory signs will clog traffic lanes just as a slow driver on Detroit expressways impedes traffic flow miles behind him. Or an overflow of traffic onto Mound Road will cause a tieup, just as too many calls will clog telephone circuits.

The system is modeled to some extent on so-called "traffic funnels" now used extensively in Germany to improve both road capacity and traffic safety through elimination of most intersection stops.

How a production problem in the manufacture of explosive switches was solved by the use of quality control is described in "Solution to an Explosive Switch Production Problem through the Use of Quality Control," by J. R. Craig and others, Sandia Corp., for the U.S. Atomic Energy Commission. A quality control theory was evolved in this research and was used to establish the fact that failure occurring in an explosive switch following a major material change was not due to the material change but was caused by a change in the design of a form tool that performed the internal finish cutting operation on the switch housing. Reversion to the original tooling design eliminated the failure. The major steps in the quality control theory were: chemical and physical analysis of raw materials; batch and tooling identification of piece parts; inspection of piece parts to assure their conformance to specifications; using statistical acceptance sampling and control chart techniques; feedback of piece part acceptance information to subcontractors; in-process inspection using control chart techniques; periodic inspection of tools and gages; accountability of all piece part batches comprising the final product; final acceptance testing to assure that the product meets the design requirements; statistical evaluation of functional test data. The 13 page report, dated April, 1961, was released to science and industry through the Office of Technical Services, Business and Defense Services Administration, U.S. Department of Commerce, Washington, D.C. Copies of SCTM 67-61-13 may be ordered for 50 cents each from OTS, U.S. Department of Commerce, Washington 25, D.C.

* * *

MetroLonics Institute of Metrology has announced the availability of a 20 page program catalog describing in detail twelve metrology training courses which will be offered on 18 separate dates between Sept. 25 and Dec. 15. Courses covered include: Introduction to Linear Metrology; Introduction to Hydraulic Metrology; Interferometry and Gage Block Calibration; Gage Block Calibration by Comparison; Thread Calibration; Surface Plate and Flatness Calibration; Gear Calibration and Inspection; Angle Measurements; Autocollimation and Alignment; Inspection Techniques (General); Surface Roughness and Roundness; and Non-Destructive Testing. Catalogs will be promptly forwarded to interested parties on request. Contact Grace Hansen, Registrar, MetroLonics Institute of Metrology, 2201 N. Hollywood Way, Burbank, Calif.



Boeing Develops New Concept in Lubricating With Air

A new concept in the use of air as a bearing lubricant is expected to result in wider applications for this type of minimum-friction bearing. The Boeing Aero-Space Division has announced development of an externally pressurized step bearing, whose load-carrying shaft spins freely on a cushion of compressed air.

The bearing is simpler than normal externally pressurized bearings, where compressed air is injected through tiny orifices in the shaft housing, forming a low-friction cushion on which the shaft rides. The Boeing design employs a single, easily drilled opening. Pressurized air entering the shaft housing through this opening becomes trapped in a shallow recess machined on the shaft. The air then lifts the shaft and becomes the bearing lubricant.

The recess traps only enough air to meet load requirements. Air flow is throttled as it escapes from the recess, rather than at the inlet, as with orifice types. Step bearings are less expensive to produce and use uncomplicated air regulating equipment. They damage less easily than orifice types.

Boeing has operated step bearings with shafts ranging from ½ to five inches in diameter and at speeds up to 100,000 rpm. Ambient operating temperatures have ranged from —330 to 600 degrees F.

Boeing is prepared to license manufacturing rights for the bearings to equipment specialists. The bearings are expected to find new uses in machine tools, high speed turbines, nuclear equipment where radiation damages normal lubricants and the paper and food processing industries.

The bearings operate well under cryogenic temperatures as well as high temperatures. In the accompanying photo, inventor C. R. Adams operates a step-type journal bearing with liquid nitrogen. The bearing operated continuously as temperature was decreased and the flow of nitrogen into the bearing changed from gas to liquid. (*Boeing Photo*)

Automatic Inspection Station

An automatic inspection station plays a significant role in the automated manufacture of deposited carbon resistors. Feedback control and self-correction of the helixing machine are based on computer-controlled analysis of values inspected here. (The helixing machine cuts a spiralled groove in the carbon film of the resistor to give it a precise resistance.) Defective resistors are automatically rejected. Marion Clark, development engineer, points to the reading on the visual monitoring graph corresponding to the rejected resistor he holds in his right hand.

From the Scrap Box

IRVING W. BURR, *Editor*
Purdue University, Lafayette, Ind.

STATISTICS Aren't Everything in Quality Control

PETER P. GRAZIANO, *SKF Industries, Inc., Philadelphia, Pa.*

There are many situations in quality control investigation work where the use of statistics—as a prime source for problem solving—is not always the whole answer.

Define the Problem

First we must define the problem. What are the factors responsible for causing the problem?

All the possible variables contributing to a problem must be thought-out in advance, so a proper plan of attack can be programed for corrective action on completion of the investigation.

This may not be simple, but it is important that before you attempt to solve a quality problem—you define it—together with the variables.

For example, in the bore grinding operation of a ball bearing, we insert the bearing ring, which we'll bore grind into a shuttle (basically a holding device). Then, the rings are placed in the shuttle. The shuttle in turn is placed into the jaws of the bore grinder. The machine then proceeds to grind what we hope is a cylindrical bore.

One of the problems we faced at SKF was that we were getting a considerable number of rejections due to out-of-roundness of the finished part. It was concluded that since the out-of-roundness would not occur in every piece that was produced, it was not basically a problem dealing with the bore grinding machine itself: it must be some variable either in the work piece or the tooling that was contributing to this problem.

A quality engineer was assigned to investigate and recommend corrective action. The engineer, after analyzing the problem and equipment, came to the conclusion that the problem of out-of-roundness was due to incorrect clearance between the outside diameter of the ring and the bore of the shuttle. The hypothesis was that the incorrect clearance resulted in one of two things: either the clearance was too small and would prevent the ring from being free to determine its own location in the shuttle, since the shuttle acts as an end clamp, or the clearance was excessive and, as a result, there was some movement that caused the rings to be out-of-round.

On this basis, we proceeded to make an analysis of races with different amounts of clearances between the bore of the shell and the outside diameter of the inner ring. Upon completion of the investigation, and although the investigator did not have absolute correlation, he did have an indication that there was a relationship between clearance and out-of-roundness.

He recommended that the tool and gage control section establish limits for the bore of the shuttle, and that closer control be established on the OD grinder of the outside diameter. These changes were made and did reduce the rejection to some extent. However, while rejections were reduced from around three to two percent out-of-roundness, the figure was still too high.

On review, the quality supervisor rapidly came to the conclusion that the problem had not properly been defined—that all the variables contributing to clearance between the shuttle and the ring had not been investigated. One objection by the quality supervisor was the fact that clearance could be affected by the amount of out-of-squareness existing between the OD of the ring and its side surface, or between the shuttle and its own face plate. He then established a program to explore the out-of-squareness existing between the shuttle and the work piece, and the out-of-squareness existing in the work piece itself, between its own OD and side surface.

This proved fruitful. First, it showed very little out-of-squareness existing between the shuttle and the face plate of the machine, the parts were square and parallel. However, the amount of out-of-squareness that existed in the races varied considerably from lot to lot and within a lot.

A second investigation was then conducted and, through the use of analysis of variance, a definite relationship was shown between total clearance, as defined by diametrical clearance, and actual squareness and resulting bore out-of-roundness. Based on this, specifications were changed to incorporate maximum permissible OD squareness on the races.

This particular example illustrates how an incorrect assumption, or an incomplete assumption, does not completely resolve the problem.

Get Help

Another major area for quality control operations improvement might be a warning: "Don't Be a Lone Wolf."

In resolving quality problems, a quality control engineer or department should take advantage of other services that exist in the company. We cannot expect a quality control engineer to be a metallurgist, a mechanical engineer, an electrical engineer, an industrial engineer, or a combination of the various types of specialists which exist in industry today.

But the quality engineer who feels he alone can resolve all problems, and take care of all corrective action, without resorting to use of all the service organizations existing in today's modern manufacturing organization will— in the long run—find his usefulness seriously curtailed because no single man or department can effectively operate without meshing with other company divisions and departments.

For example, in the previous problem, although its nature indicates the solution to be found, this does not necessarily dictate the best approach for the company to take. One of the major points concluded from the investigation was that OD squareness was a contributing factor to the out-of-roundness in the bore.

The problem of OD squareness originates at the OD operation on the part.

Because the OD of the ring was only a chucking surface and not

ASQC LCS Codes 330;331:60;70:400

critical from a bearing application viewpoint, only one pass through the centerless was performed. But as the investigation showed this one pass through the centerless was not sufficient to control the amount of OD squareness to a known value. To control the OD squareness so that rejections at bore grinding were held to 0.5 percent, it was necessary to add a second pass.

At this stage of the game, we have to introduce the industrial engineering department into the act for the simple purpose of determining the economics of the situation. Is it cheaper to leave the OD at one pass, which would then result in taking three percent scrap at the bore grinding operation, or is it cheaper to add another pass on the OD operation, and reduce the rejection to 0.5 percent?

The quality control investigation, to be complete, *must* take-in this cost consideration. The quality control department, in its own right, should not be making this cost determination. But it should certainly take advantage of the service of the industrial engineering department to determine this.

The point to be emphasized is that it is necessary for the quality control department to take advantage of other services not only in bringing a problem to a successful solution—but also in the original engineering appraisal of the problem to be sure what other factors might be considered.

Can the operating department throw any light on the problem which might help in resolving the situation? Can the mechanical engineering department, industrial engineering department or the lab aid in the problem? These departments should not be excluded. The quality control department should seek and enlist their aid in solving problems and taking corrective action.

Quality control is a company-wide function. It must embrace the other departments for effective, long-range control.

Sell Quality Control

The third major area contributing to an effective quality control engineer is the fact that he must be an effective salesman!

The quality control engineer has an unusual position. First, he has his own internal problem and must exercise pressure to maintain quality. In his position, he can become a very unpopoular individual. On the other hand, he must also take care of customer complaints. Often he is faced with a problem of customers who are making, or who have made, incorrect decisions concerning the quality of his company's product. He must be able to handle them diplomatically. So, as a result, the quality engineer must be able to sell himself in two directions: first, to the operating people with whom he deals, and secondly, to the various customers with whom he may become involved.

To be an effective salesman, there are several things a quality engineer should consider before he tries to sell his own idea to his supervisor, or some program to an operating group, or solve a quality problem for a customer.

The quality engineer, to successfully sell an item (and I should not say just the quality engineer but any individual who must sell ideas or a program) must first demonstrate the need for his idea. Then he must create a desire in the individual he is trying to sell. Next, he must be prepared to remove any resistance a buyer may have to his program.

When he is successful in showing the need, creating the desire, and eliminating the resistance, there is only one answer—he will get action on his ideas. In dealing with people, we must be sure we approach them *with the benefits they will receive!*

And don't use up all the benefits at once. Give them one or two benefits to think about and chew on. Keep a few benefits in reserve, in case you have to resell a point based on some particular point of resistance. Stimulate this desire for your idea with the use of charts, examples, anything that will create a stimulus in the buyer for your idea.

Then make sure when you're finished, you request action from him. The effective quality engineer does not rely only on statistics to effectively overcome quality problems. Statistics are a valuable tool, without them we could not resolve many problems, but a good quality engineer only consumes part of his time with statistics. They are only a tool. Use them as the means to an end as you do the other tools in your kit-bag.

Pontiac Division, GMC, Adopts Quality Audit Inspection Procedure

A new car quality audit inspection procedure has been established by the Pontiac Division, General Motors Corp., in its home Pontiac, Mich. plant and in each of six assembly plants across the country.

Stressing standardization and uniformity, the system employs two technically trained audit teams rotating between each of the seven plants to check completed car quality on a continual basis.

Identical car quality audit areas in all seven plants are specially equipped for checking both Pontiacs and Tempests 100 percent for chassis and body assembly quality.

Cars to be quality audited are selected at random from cars ready to ship to dealers. A car hoist is available for under body inspection and bolt torque tests along with special lighting for the inspection of painted and plated surfaces.

The audit cars also undergo rigid water dust leak checks as well as extensive road testing under all driving conditions. A minimum of 340 uniform check points are completed during the audit of each automobile.

Any discrepancies noted in the audits are immediately reported by the teams to joint meetings of key assembly and reliability supervision assigned permanently to the particular plant, enabling a quick remedy of any deficiency.

The objective of the Reliability Department's car audit quality teams is to insure that design and engineering objectives are achieved in each and every Pontiac and Tempest. Prior to quality audit more than 15,000 inspection checks are made on each car and its major components.

S. E. Knudsen, vice president GMC and general manager Pontiac, explained that all checks and controls are directed toward attainment of the reliability concept that their cars will always look the way they should look and perform the way they should perform.

American Society for Quality Control, Inc.

GENERAL TECHNICAL COUNCIL

Warren R. Purcell, *Chairman*
Raytheon Company
Executive Offices
Lexington 73, Massachusetts
Horace P. Andrews
Oscar H. Bishop
Irving W. Burr
David S. Chambers
Paul C. Clifford
Harold F. Dodge
Herbert B. Epstein
Robert G. Fitzgibbons
Frank E. Grubbs
R. Calvert Haws
John L. Kidwell
Fred C. Leone
Paul S. Olmstead
Emil M. Olsen
John J. Ryan
Frank J. Sindelar
Mae-Goodwin Tarver (Miss)
Ervin F. Taylor
Milton E. Terry
H. Dean Voegtlen
James W. Wheeler
Sigmund P. Zobel
Leslie S. Eichelberger, *ex officio*
A. V. Feigenbaum, *ex officio*
E. J. Lancaster, *ex officio*
Gayle W. McElrath, *ex officio*

GENERAL PROFESSIONAL COUNCIL

Leslie S. Eichelberger, *Chairman*
2408 North 84th Street
Wauwatosa 13, Wisconsin
Henry J. Becker
Irving W. Burr
Edward P. Coleman
Winston McS. Davis
George A. Endrich
Herbert B. Epstein
C. Eugene Fisher
William A. Golomski
Charles J. Hudson
August B. Mundel
John G. Rutherford
Leonard A. Seder
Sigmund P. Zobel
A. V. Feigenbaum, *ex officio*
E. J. Lancaster, *ex officio*
Gayle W. McElrath, *ex officio*
Warren R. Purcell, *ex officio*

STANDING COMMITTEES

AUDITING

Paul A. Robert, *Chairman*
Precision Products Company
Box 130
Norwood 12, Ohio
Howard R. Bolton
Blair E. Olmstead
H. George Thompson
Thomas H. Williams

EXAMINING

Henry J. Becker, *Chairman* (65)
American Steel and Wire Company
Waukegan, Illinois
Simon Collier (64)
Richard H. Ede (63)
Enoch B. Ferrell (62)
Irvin W. Schoeninger (66)

NOMINATING

J. Y. McClure, *Chairman*
Convair, A Division of
General Dynamics Corp.
Fort Worth, Texas
R. Shaw Goldthwait
Sam L. Grasso
Marsh B. Gwynn
Owen F. Keeler
Walter C. Klontz
Harry I. Matosoff

CONSTITUTION & BYLAWS

George D. Edwards, *Chairman* (65)
1 Charles Road
Cape Elizabeth, Maine
Alfred L. Davis (62)
John B. Pringle (63)
Warren R. Purcell (64)
William P. Schwager (66)

FINANCIAL ADVISORY

Wade R. Weaver, *Chairman* (63)
Republic Steel Corporation
Cleveland 15, Ohio
Leon Bass (65)
George D. Edwards (67)

PROFESSIONAL ETHICS & QUALIFICATIONS

Charles J. Hudson, *Chairman* (62)
74 Newton Street
West Boylston, Massachusetts
Carl W. Nickerson (64)
Francis B. Olson (65)
John G. Rutherford (63)
Bonnie B. Small (Miss) (66)

ADDITIONAL COMMITTEES

APPLIED METHODOLOGY

Fred C. Leone, *Chairman* (64)
Case Institute of Technology
Cleveland, Ohio
Carl A. Bennett (62)
Cecil C. Craig (62)
Enoch B. Ferrell (63)
Richard A. Freund (63)
Carl E. Noble (62)
Edwin G. Olds (63)
Milton E. Terry (64)
Frank W. Wehrfritz (64)

AWARDS

C. Eugene Fisher, *Chairman* (64)
Bell Telephone Laboratories
463 West Street
New York 14, New York
Philip L. Alger (65)
Allin P. Deacon (66)
Paul A. Robert (62)
Harry G. Romig (63)

BIBLIOGRAPHY & LIBRARY

Ervin F. Taylor, *Chairman*
Mail #2000
The Martin Company
Baltimore 3, Maryland
Gordon A. Baines (64)
Charles A. Bicking (63)
Paul C. Clifford (62)
George R. Foster
Rudolph Freedman (62)
Hugo C. Hamaker
William J. Hepburn (64)
Richard M. Jacobs
Joseph Movshin (62)
Seymour M. Selig (63)
Mason E. Wescott
Irving W. Burr, *ex officio*

BRUMBAUGH AWARD

CUYLER J. HAWKES, *Chairman*
Eastman Kodak Company
400 Plymouth Avenue, North
Rochester 4, New York
Niles H. Barnard (64)
Harmon S. Bayer (65)
Edward R. Close (63)
August B. Mundel (65)
Edwin G. Olds (62)
Mary N. Torrey (Miss) (64)
Roy A. Wylie (63)
Irving W. Burr, *ex officio*
A. V. Feigenbaum, *ex officio*

COLLEGE RELATIONS

EDWARD P. COLEMAN, *Chairman*
University of California
405 Hilgard Avenue
Los Angeles 24, California
Max Astrachan
Frank E. Grubbs
William C. Hanna
John H. K. Kao
Gayle W. McElrath
Obert B. Moan
Ralph O. Swalm

CONFERENCES

DONALD D. BARON, *Chairman*
Minneapolis-Honeywell Regulator Co.
8330 North Austin Avenue
Morton Grove, Illinois
Henry J. Becker
Ralph D. Humphries
F. Bruce May
Gayle W. McElrath

CONVENTION PROGRAM

MICHAEL J. O'CALLAGHAN, *Chairman*
Schick, Inc.
Lancaster, Pennsylvania
Irving W. Burr
Herbert B. Epstein
Robert A. Ferry
George R. Foster
Andrew C. Irvine
Kenneth S. Stephens

EDUCATION & TRAINING INSTITUTE

Executive Board

DAVID S. CHAMBERS, *Chairman* (62)
University of Tennessee
Box 8175, University Station
Knoxville, Tennessee
L. N. Bress (66)
C. Eugene Fisher (64)
Ellis R. Ott (63)
Maynard S. Renner (65)
Paul C. Clifford, *ex officio*
A. V. Feigenbaum, *ex officio*

Director

PAUL C. CLIFFORD,
39 Norman Road
Montclair, New Jersey

EDWARDS MEDAL

ALLIN P. DEACON, *Chairman* (62)
36 Bridge Street
Brantford, Ontario, Canada
H. Davis Birch (63)
Simon Collier (64)
Howard L. Jones (64)
Gerald J. Lieberman (63)
A. W. Wortham (62)
A. V. Feigenbaum, *ex officio*

EXHIBITS

FRANK CAPLAN, JR., *Chairman*
Westinghouse Electric Corporation
Atomic Fuel Department
Cheswick, Pennsylvania
Gordon H. Beckhart
L. E. Henryson
Ralph D. Humphries
Raymond E. Marks
W. Gordon Thompson
Howard C. Todt
Robert Vujovich
Roy A. Wylie

FILM LIBRARY

J. FREDERICK VERIGAN, *Chairman*
107 Poplar Drive
Woodsfield, Ohio
Arnold E. Jakel
Henry J. Jacobson
Halsey H. Kent
Elmer F. Lalonde
William R. Pabst, Jr.

GOVERNMENT RELATIONS

WINSTON McS. DAVIS, *Chairman*
The Chesapeake & Potomac
Telephone Co.
930 H Street, Northwest
Washington 1, D. C.
Gordon J. Keefe
Chester H. McCall, Jr.
Orville O. Price
Donald C. Riley
O. W. Teckemeyer

HISTORICAL

KARL J. BAUER, *Chairman*
Production Quality Control
Abbott Laboratories
14th and Sheridan Road
North Chicago, Illinois

INTERNATIONAL COOPERATION

PAUL C. CLIFFORD, *Chairman*
39 Norman Road
Montclair, New Jersey
Charles A. Bicking (62)
George E. P. Box (63)
Cuthbert Daniel (62)
W. Edwards Deming (62)
Bernard Hecht (63)
Joseph M. Juran (64)
Roger Lessard (63)
George J. Levenbach (63)
Bessie B. Mauss (Mrs.) (62)
Robert G. Mitchell (62)
August B. Mundel (64)
Ellis R. Ott (64)
William B. Pabst, Jr. (64)
Harry G. Romig (63)

LONG-RANGE PLANNING

LEON BASS, *Chairman*
Large Jet Engine Department
General Electric Company
Building 500
Cincinnati 15, Ohio
A. V. Feigenbaum
C. Eugene Fisher
O. C. Griffith
Joseph M. Juran
John J. Riordan
Paul A. Robert

MEMBERSHIP COMMITTEE

WILLIAM E. BARKER, *Chairman*
Jet Engine Department
General Electric Company
Cincinnati 15, Ohio
Vida Grace Hildyard (Mrs.)
James E. McGarrah
Dellford B. Tallon
William P. Youngclaus, Jr.

OPERATIONS RESEARCH

PAUL S. OLMSTEAD, *Chairman*
Bell Telephone Laboratories
Whippany, New Jersey
Max Astrachan
Charles A. Bicking
Acheson J. Duncan
Fred C. Leone
Michael J. O'Callaghan
Samuel S. Wilks

PROFESSIONAL LICENSING

JOHN G. RUTHERFORD, *Chairman*
Semiconductor Division
Raytheon Company
Lewiston, Maine
Acheson J. Duncan
O. C. Griffith
Joseph M. Juran
Samuel S. J. Skolnik

PROFESSIONAL PLANNING & DEVELOPMENT

WILLIAM A. GOLOMSKI, *Chairman* (63)
2229 East Newberry Boulevard
Milwaukee 11, Wisconsin
L. Charles Freeman, Jr. (62)
Paul A. Robert (64)

PROGRAM & SPEAKERS

HERBERT B. EPSTEIN, *Chairman* (63)
Vought Electronics
P. O. Box 1500
Arlington, Texas
Oscar H. Bishop (64)
Herman H. Bogin (62)
Brant Bonner (63)
George M. Cohan (63)
Robert A. Ferry (62)
Marsh B. Gwynn (63)
Harold C. Hilditch (62)
Richard M. Jacobs (63)
Vincent J. Lukach (64)
George E. Lyman (64)
Michael J. O'Callaghan (64)
J. Glenn Olree (64)
John B. Pringle (63)
Kenneth S. Stephens (64)
Dellford B. Tallon (62)
Howard C. Todt (63)
Thomas E. Turner (62)

PUBLICATIONS

RICHARD S. BINGHAM, JR., *Chairman*
Quality Control Department
Carborundum Company
P. O. Box 477
Niagara Falls, New York
E. Harvey Barnett, Jr.
Ralph D. Humphries
J. Stuart Hunter
August B. Mundel
Mason E. Wescott
George R. Foster, *ex officio*
Irving W. Burr, *ex officio*
A. W. Wortham, *ex officio*

PUBLICITY & PROMOTION

LYLE D. CONNELL, *Chairman*
Quality Control Supervisor
Westinghouse Electric Corporation
Sunnyvale, California
Lester P. Gideon
Paul K. Leatherman
Stanley B. Sherwood
Howard C. Todt
George B. Westerhaus

RELATIONS WITH OTHER PROFESSIONAL SOCIETIES

SIGMUND P. ZOBEL, *Chairman* (64)
16 Addison
Eggertsville 12, New York
Allin P. Deacon (62)
V. R. Grom (64)
Roger Lessard (63)
Wm. A. MacCrehan, Jr. (62)
Neil McCarthy (63)
Frank S. Riordan, Jr. (62)
Victor B. Shelburne (64)
Arthur Stein (63)

SECTION DEVELOPMENT

H. DAVIS BIRCH, *Chairman*
Large Jet Engine Department
General Electric Company
Cincinnati 15, Ohio
William E. Barker
Robert M. Berg
Allin P. Deacon
R. Shaw Goldthwait
Sam L. Grasso
R. Calvert Haws
Robert L. Heath
Lynn A. Hibbs
Keith L. Lewis
Julius P. Mehalek
W. Ralph Reeves
James T. Skelton
Andrew P. Stergion
Dellford B. Tallon
W. Gordon Thompson
Thomas E. Turner

SADDORIS AWARD

HARTER G. HUDSON, *Chairman*
Owens-Illinois
P.O. Box 3431, Rincon Annex
San Francisco, California
H. Davis Birch
A. E. Brownrigg
Irving W. Burr
David S. Chambers
Lyle D. Connell
George R. Foster
William A. Golomski
William I. Martin
Claude I. Taylor
Jean Truettner (Miss)
Murray N. Whitehead

SECTION LIAISON

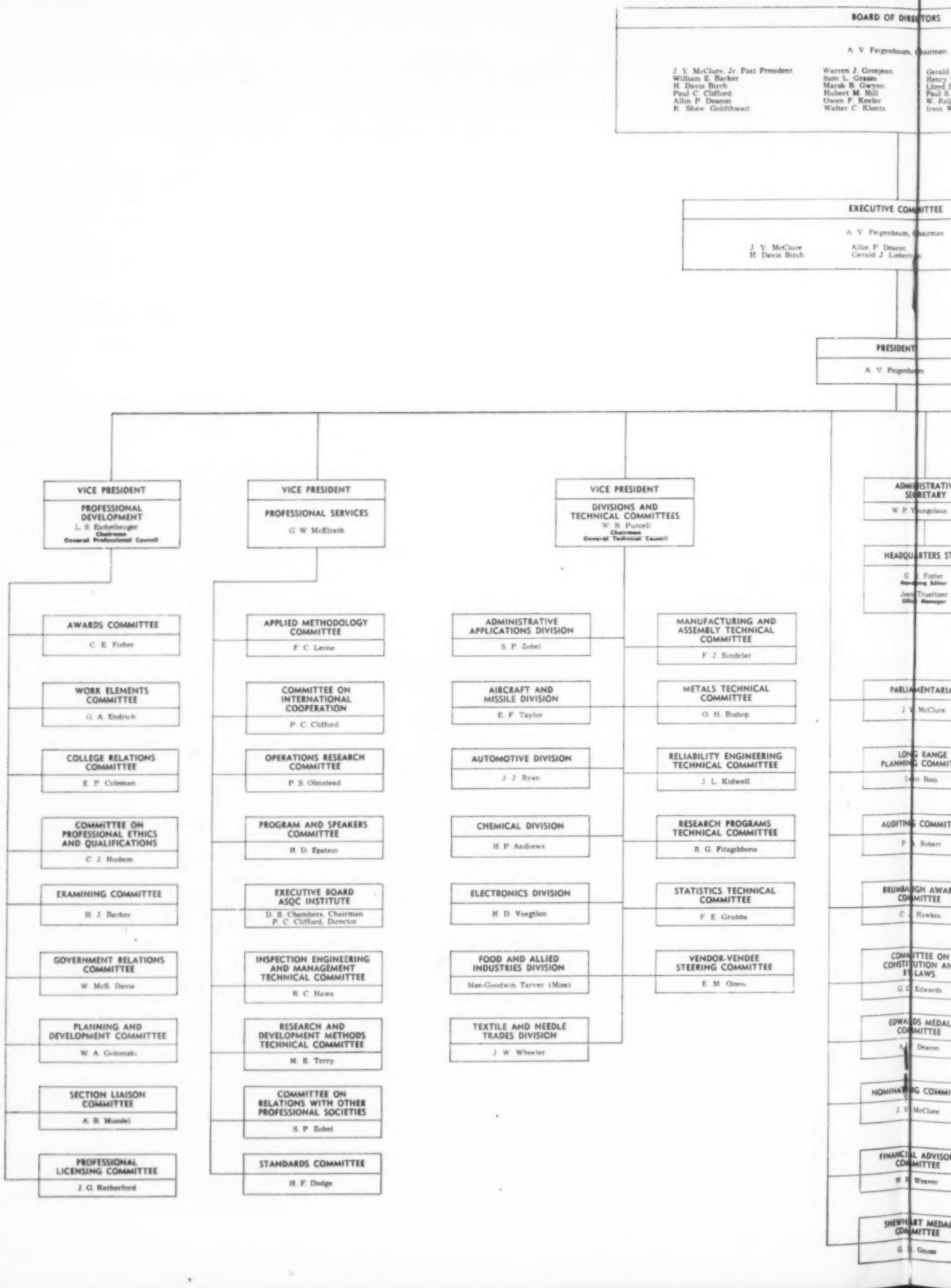
AUGUST B. MUNDEL, *Chairman*
Sonotone Corporation
Elmsford, New York
Robert J. Fopma
Jack S. Gantt
William F. Kohl
Julius P. Mehalek
Edwin S. Shecter

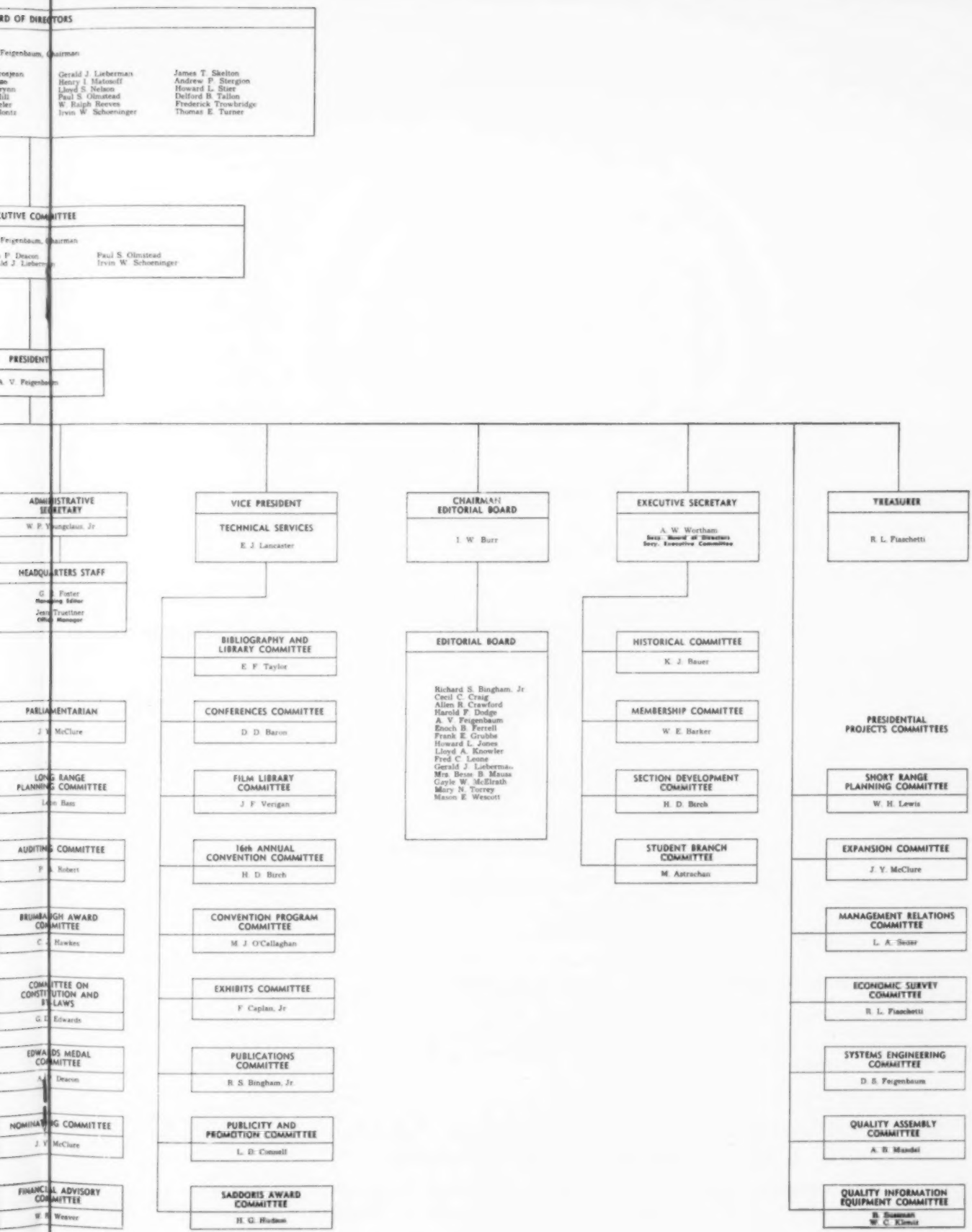
SHEWHART MEDAL

G. RUPERT GAUSS, *Chairman* (63)
Bell Telephone Laboratories
463 West Street
New York 14, New York
Leon Bass (65)
Cecil C. Craig (64)
Harold F. Dodge (62)
Eugene L. Grant (65)
Ben H. Lloyd (64)
Carl E. Noble (63)
Edwin G. Olds (62)
A. V. Feigenbaum, *ex officio*

16th ANNUAL CONVENTION

H. DAVIS BIRCH, *Chairman*
General Electric Company
Building 500
Cincinnati 15, Ohio
William E. Barker
Bernice Bass (Mrs.)
Leon Bass
Henry J. Becker
Robert M. Berg
Donald A. Bradshaw
Frank Caplan, Jr.
Robert A. Ferry
Robert N. Johnson
Norman Kravitz
Jack L. Mairose
Michael J. O'Callaghan
Frank W. Pandorf
Dick M. Race
Paul A. Robert
William E. Smith
W. Gordon Thompson
Joseph S. Turner
Louis R. Zimov
William P. Youngclaus, Jr., *ex officio*


BOARD OF DIRECTORS
A. V. Feigenbaum, Chairman
J. Y. McClure, Jr. Past President
William E. Barker
H. Davis Birch
Paul C. Clifford
Allin P. Deacon
R. Shaw Goldthwait
Warren J. Grosjean
Sam L. Grasso
Marsh B. Gwynn
Hubert M. Hill
Owen F. Keeler
Walter C. Klontz
EXECUTIVE COMMITTEE
A. V. Feigenbaum, Chairman
J. Y. McClure
H. Davis Birch
Allin P. Deacon
PRESIDENT
A. V. Feigenbaum
VICE PRESIDENT
PROFESSIONAL DEVELOPMENT
L. S. Eschelberger
Chairman
General Professional Council
VICE PRESIDENT
PROFESSIONAL SERVICES
G. W. McElrath
VICE PRESIDENT
DIVISIONS AND TECHNICAL COMMITTEES
W. B. Purcell
Chairman
General Technical Council
AWARDS COMMITTEE
C. E. Fisher
WORK ELEMENTS COMMITTEE
G. A. Endruh
COLLEGE RELATIONS COMMITTEE
E. P. Coleman
COMMITTEE ON PROFESSIONAL ETHICS AND QUALIFICATIONS
C. J. Hudson
EXAMINING COMMITTEE
H. J. Becker
GOVERNMENT RELATIONS COMMITTEE
W. McS. Davis
PLANNING AND DEVELOPMENT COMMITTEE
W. A. Golomski
SECTION LIAISON COMMITTEE
A. B. Mandel
PROFESSIONAL LICENSING COMMITTEE
J. G. Rutherford
APPLIED METHODOLOGY COMMITTEE
F. C. Leone
COMMITTEE ON INTERNATIONAL COOPERATION
P. C. Clifford
OPERATIONS RESEARCH COMMITTEE
P. S. Olmstead
PROGRAM AND SPEAKERS COMMITTEE
H. D. Epstein
EXECUTIVE BOARD ASQC INSTITUTE
D. S. Chambers, Chairman
P. C. Clifford, Director
INSPECTION ENGINEERING AND MANAGEMENT TECHNICAL COMMITTEE
R. C. Hawa
RESEARCH AND DEVELOPMENT METHODS TECHNICAL COMMITTEE
M. E. Terry
COMMITTEE ON RELATIONS WITH OTHER PROFESSIONAL SOCIETIES
S. P. Zobel
STANDARDS COMMITTEE
H. F. Dodge
ADMINISTRATIVE APPLICATIONS DIVISION
S. P. Zobel
AIRCRAFT AND MISSILE DIVISION
E. F. Taylor
AUTOMOTIVE DIVISION
J. J. Ryan
CHEMICAL DIVISION
H. P. Andrews
ELECTRONICS DIVISION
H. D. Voegtlen
FOOD AND ALLIED INDUSTRIES DIVISION
Mae-Goodwin Tarver (Miss)
TEXTILE AND NEEDLE TRADES DIVISION
J. W. Wheeler
MANUFACTURING AND ASSEMBLY TECHNICAL COMMITTEE
F. J. Sindelar
METALS TECHNICAL COMMITTEE
O. H. Bishop
RELIABILITY ENGINEERING TECHNICAL COMMITTEE
J. L. Kidwell
RESEARCH PROGRAMS TECHNICAL COMMITTEE
R. G. Fitzgibbons
STATISTICS TECHNICAL COMMITTEE
F. E. Grubbs
VENDOR-VENDEE STEERING COMMITTEE
E. M. Olsen
ADMINISTRATIVE SECRETARY
W. P. Youngclaus
HEADQUARTERS ST
G. L. Foster
Managing Editor
Jean Truettner
Office Manager
PARLIAMENTARIA
J. Y. McClure
LONG RANGE PLANNING COMMIT
Leon Bass
AUDITING COMMIT
P. A. Robert
BRUMBAUGH AWAR COMMITTEE
C. A. Hawkes
COMMITTEE ON CONSTITUTION AN BY-LAWS
G. D. Edwards
EDWARDS MEDAL COMMITTEE
A. V. Deacon
NOMINATING COMMI
J. Y. McClure
FINANCIAL ADVISOR COMMITTEE
W. R. Weaver
SHEWHART MEDAL COMMITTEE
G. L. Goode


RD OF DIRECTORS
Feigenbaum, Chairman
Gerald J. Lieberman
Henry J. Matonoff
Lloyd S. Nelson
Paul S. Olmstead
W. Ralph Reeves
Irvin W. Schoeninger
James T. Skelton
Andrew P. Stergion
Howard L. Stier
Delford B. Tallon
Frederick Trowbridge
Thomas E. Turner
UTIVE COMMITTEE
Feigenbaum, Chairman
Paul S. Olmstead
Irvin W. Schoeninger
PRESIDENT
A. V. Feigenbaum
ADMINISTRATIVE SECRETARY
W. P. Youngclaus, Jr
HEADQUARTERS STAFF
G. J. Foster
Managing Editor
Jean Truettner
Office Manager
PARLIAMENTARIAN
J. Y. McClure
LONG RANGE PLANNING COMMITTEE
Leon Bass
AUDITING COMMITTEE
P. A. Robert
BRUMBAUGH AWARD COMMITTEE
C. J. Hawkes
COMMITTEE ON CONSTITUTION AND BY-LAWS
G. D. Edwards
EDWARDS MEDAL COMMITTEE
A. F. Deacon
NOMINATING COMMITTEE
J. Y. McClure
FINANCIAL ADVISORY COMMITTEE
W. F. Weaver
SHEWHART MEDAL COMMITTEE
G. S. Gause
VICE PRESIDENT
TECHNICAL SERVICES
E. J. Lancaster
BIBLIOGRAPHY AND LIBRARY COMMITTEE
E. F. Taylor
CONFERENCES COMMITTEE
D. D. Baron
FILM LIBRARY COMMITTEE
J. F. Verigan
16th ANNUAL CONVENTION COMMITTEE
H. D. Birch
CONVENTION PROGRAM COMMITTEE
M. J. O'Callaghan
EXHIBITS COMMITTEE
F. Caplan, Jr
PUBLICATIONS COMMITTEE
R. S. Bingham, Jr.
PUBLICITY AND PROMOTION COMMITTEE
L. D. Cissell
SADDORIS AWARD COMMITTEE
H. G. Hudson
CHAIRMAN EDITORIAL BOARD
I. W. Burr
EDITORIAL BOARD
Richard S. Bingham, Jr.
Cecil C. Craig
Allen R. Crawford
Harold F. Dodge
A. V. Feigenbaum
Enoch B. Ferrell
Frank E. Grubbs
Howard L. Jones
Lloyd A. Knowler
Fred C. Leone
Gerald J. Lieberman
Mrs. Bess B. Mauss
Gayle W. McElrath
Mary N. Torrey
Mason E. Wescott
EXECUTIVE SECRETARY
A. W. Wortham
Secy., Board of Directors
Secy., Executive Committee
HISTORICAL COMMITTEE
K. J. Bauer
MEMBERSHIP COMMITTEE
W. E. Barker
SECTION DEVELOPMENT COMMITTEE
H. D. Birch
STUDENT BRANCH COMMITTEE
M. Astrachan
TREASURER
R. L. Fianchetti
PRESIDENTIAL PROJECTS COMMITTEES
SHORT RANGE PLANNING COMMITTEE
W. H. Lewis
EXPANSION COMMITTEE
J. Y. McClure
MANAGEMENT RELATIONS COMMITTEE
L. A. Seder
ECONOMIC SURVEY COMMITTEE
R. L. Fianchetti
SYSTEMS ENGINEERING COMMITTEE
D. S. Feigenbaum
QUALITY ASSEMBLY COMMITTEE
A. B. Mandel
QUALITY INFORMATION EQUIPMENT COMMITTEE
B. Sussman
W. C. Klenz

STANDARDS

HAROLD F. DODGE, *Chairman* (63)
Rutgers • The State University
New Brunswick, New Jersey
Irving W. Burr (65)
W. Edwards Deming (66)
William R. Pabst, Jr. (64)
Ralph E. Wareham (62)

STUDENT BRANCH

MAX ASTRACHAN, *Chairman*
The Rand Corporation
1700 Main Street
Santa Monica, California
Benjamin K. Gold
Howard L. Jones
Fred C. Leone
Joseph J. Moder, Jr.
Harry G. Romig

WORK ELEMENTS DEVELOPMENT

GEORGE A. ENDRICH, *Chairman*
General Electric Company
Syracuse, New York
Richard S. Bingham, Jr.
Samuel L. Carrell
Carl E. Marshall
Mahlon H. Replogle
Samuel S. J. Skolnik
John C. Tepper
Courtlandt C. VanVechten
A. W. Wortham

PRESIDENTIAL PROJECTS COMMITTEES

ECONOMIC SURVEY

ROCCO L. FIASCHETTI, *Chairman*
Ansco Division
40 Charles Street
Binghamton, New York

EXPANSION

J. Y. MCCLURE, *Chairman*
Convair, A Division of
General Dynamics Corp.
Fort Worth, Texas

MANAGEMENT RELATIONS

LEONARD A. SEDER, *Chairman*
267 Hawthorne Street
Malden 48, Massachusetts

QUALITY INFORMATION EQUIPMENT

BERNARD SUSSMAN, *Co-Chairman*
Specialty Control Department
General Electric Company
Waynesboro, Virginia
WALTER C. KLONTZ, *Co-Chairman*
Motorola, Inc.
Scottsdale, Arizona

QUALITY ASSEMBLY

AUGUST B. MUNDEL, *Chairman*
Sonotone Corporation
Elmsford, New York

SHORT-RANGE PLANNING

WYATT H. LEWIS, *Chairman*
General Electric Company
570 Lexington Avenue
New York 22, New York

SYSTEMS ENGINEERING

D. S. FEIGENBAUM, *Chairman*
23 Edward Avenue
Pittsfield, Massachusetts

DIVISION OFFICERS

ADMINISTRATIVE APPLICATIONS

SIGMUND P. ZOBEL, *Chairman*
16 Addison
Eggertsville 12, New York
Claude I. Taylor, *Vice Chairman*
William C. Hartman, *Secretary*
Bonnie B. Small (Miss), *Treasurer*

AIRCRAFT & MISSILE

ERVIN F. TAYLOR, *Chairman*
6406 Lochcrest Road
Baltimore 12, Maryland
Kenneth L. Jones, *Vice Chairman*
Harry D. Greiner, *Secretary*
E. J. Lancaster, *Treasurer*

AUTOMOTIVE

JOHN J. RYAN, *Chairman*
22825 Poplar Beach Drive
St. Clair Shores, Michigan
Dale A. Cue, *Vice Chairman*
Louis Haydu, *Secretary*
J. G. Jarvis, *Treasurer*

CHEMICAL

HORACE P. ANDREWS, *Chairman*
Swift & Company Research Labs
400 East 33rd Street
Chicago 15, Illinois
Norman C. Hodge, *Vice Chairman*
Karl J. Bauer, *Secretary*
Ralph C. Manring, *Treasurer*

ELECTRONICS

H. DEAN VOEGTLEN, *Chairman*
2 Erlington Place
Riverton, New Jersey
Harry W. Shifflett, *Vice Chairman*
John F. Teunisson, *Secretary*
Alexander Sternberg, *Treasurer*

FOOD & ALLIED INDUSTRIES

MAE-GOODWIN TARVER (Miss), *Chairman*
1911 West Estes
Chicago 26, Illinois
Abe Mittler, *Vice Chairman*
Norman E. Liles, *Secretary*
Hy Pitt, *Treasurer*

TEXTILE & NEEDLE TRADES

JAMES W. WHEELER, *Chairman*
Box 111, Canton Cotton Mills
Canton, Georgia
W. S. McMann, *Vice Chairman*
Homer F. Littleton, *Secretary*
Charles S. Lawrence, *Treasurer*

TECHNICAL COMMITTEE CHAIRMEN

INSPECTION ENGINEERING & MANAGEMENT

R. CALVERT HAWS
Quality Control Engineers, Inc.
6300 Wilshire Boulevard
Los Angeles 48, California

MANUFACTURING & ASSEMBLY

FRANK J. SINDELAR
World Headquarters
IBM Corporation
New York, New York

METALS

OSCAR H. BISHOP
Reynolds Metals Company
Richmond 18, Virginia

RELIABILITY ENGINEERING

JOHN L. KIDWELL
Lycoming Division
AVCO Corporation
Stratford, Connecticut

RESEARCH & DEVELOPMENT METHODS

MILTON E. TERRY
Bell Telephone Laboratories
463 West Street
New York 14, New York

RESEARCH PROGRAMS

ROBERT G. FITZGIBBONS
Raytheon Company
Wayland, Massachusetts

STATISTICS

FRANK E. GRUBBS
Ballistic Research Laboratory
Aberdeen Proving Ground, Maryland

VENDOR-VENDEE

EMIL M. OLSEN
906 Fiske Street
Pacific Palisades, California

REGIONAL CONFERENCE BOARDS

NEW ENGLAND

JOHN A. SEIGMANN, *Chairman*
R. T. Vanderbilt Company, Inc.
East Norwalk, Connecticut

MID-WEST

HARRY O. HEHNER, *Chairman*
Monsanto Chemical Company
800 North Lindbergh Boulevard
St. Louis 66, Missouri

WESTERN

NORMAN W. STEELE, *Chairman*
607 North 82nd Street
Seattle 3, Washington

Said Gaspard de Coriolis: *"A particle which is subject to no forces in a rotating coordinate system experiences a radial acceleration and a tangential acceleration."*

It was around 1840 that Coriolis discovered what has since become known as the Coriolis Effect. He noticed objects above the earth tend to rotate relative to the earth's rotation...to the right in the northern hemisphere, to the left in the southern.

The Coriolis Effect is in force in outer space, too. If a space vehicle is rotated in order to establish artificial gravity, the necessarily short radius of the rotation causes a Coriolis force. This creates orientation problems for a human occupant. To eliminate this difficulty, a scientist at Lockheed Missiles & Space Company conceived the idea of connecting the vehicle to an auxiliary fuel tank by a half-mile-long cable. Thus, if the whole system is then rotated at a reduced speed around its center of mass gravity, the longer radius greatly minimizes the Coriolis force. Right now—on the drawing boards at Lockheed—is an enormously advanced space vehicle system which utilizes this concept, in addition to many others.

Fortunately, natural laws are about the only restrictions which circumscribe scientists and engineers at Lockheed Missiles & Space Company. The climate in Sunnyvale and Palo Alto, on the San Francisco Peninsula, is close to perfection. The creative atmosphere—the opportunity to work on such important projects as the DISCOVERER and MIDAS satellites, the POLARIS FBM, or even more advanced concepts such as the space system cited above—is the dream of the creative engineer.

Why not investigate future possibilities at Lockheed? Write Research and Development Staff, Dept. M-11C, 962 West El Camino Real, Sunnyvale, Calif. U.S. citizenship or existing Department of Defense industrial security clearance required. An Equal Opportunity Employer.

LOCKHEED MISSILES & SPACE COMPANY

A GROUP DIVISION OF LOCKHEED AIRCRAFT CORPORATION

Systems Manager for the Navy POLARIS FBM and the Air Force AGENA Satellite in the DISCOVERER and MIDAS programs. Other current programs include SAINT, ADVENT and such NASA projects as OGO, OAO, ECHO, and NIMBUS.

SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA • CAPE CANAVERAL, FLORIDA • HAWAII

section briefs

ALBANY . . . The executive committee recently met with new officers and committee chairmen for orientation and planning. New officers are M. B. Lindquist, chairman; M. P. Flannagan, vice chairman; P. Paniszczyn, secretary, and J. F. Lauritsen, treasurer.

K. W. Trevithick

ALBUQUERQUE . . . July 18, the new officers—G. O. Hawley, chairman; R. L. Gifford, secretary, and J. A. Teresi, treasurer—held a meeting with the new committee chairmen to discuss plans for the 1961-62 season . . .

An evening QC course will be offered by the University of New Mexico this fall with Dan Sheldon as instructor.

J. A. Woodley

AKRON-CANTON . . . Oct. 19, tour of the Boiler Division of Babcock & Wilcox Co., Barberton, Ohio . . . Products such as boilers, stokers, burners, heat exchangers, nuclear reactors, fuel elements and nuclear components are manufactured by this company . . .

Oct. 26, monthly meeting of the executive committee . . .

D. E. Gorsline

ALLENTOWN-BETHLEHEM . . . In looking over our material for items of interest for the October issue we ran across a copy of the program for the 1961 Annual Convention. We noted with a great deal of pride the presence of the names of a relatively large number of section members or ex-members who were participating in developing or taking part in the Convention. Among the names we noted were Miss Bonnie Small, Bob Schin, Ken Stephens, Bob Heiland, Dick Bingham, Harry Bear and Wally Richardson. We feel highly honored to have been associated with people like these over the years!

Incidently, our current executive committee is made up of people for whom we forsee a bright future. Whil we were vacationing, they have been working on pla for a big year. Our thanks to Bryn Hammarstro chairman; Charlie Weeks and Jim Miller, vice chairm Hal Spaulding, secretary; Bob Tust, treasurer; Mantz, program chairman; Vince Lukach, educa chairman; Bud Gillette, auditor; Al DeWitt, exhi chairman; Charlie Popik, constitution and bylaws cha man; Nevin Kuntz, arrangements chairman; Russ Bodnyk, membership chairman; Dick Zwyckl, Saddoris Award chairman, and Bob Hortsman, national publicity.

David F. Roberts

ALLENTOWN-BETHLEHEM — READING SUBSECTION . . . Chairman Wes Sawyer, Western Electric Co., has appointed the following committee chairmen: arrangements—Fred Payez, Pennslyvania Optical Co.; program—Bob Field, Western Electric Co. Charlie Pratt, Bob Bryan and Joe Napolitano round out the appointments. Our executive committee has been rather active this summer and we are looking forward to a successful season.

Oct. 28, QC conference jointly sponsored by the Reading subsection and the Reading chapter of the Society for Advancement of Management at Albright College . . . Speaker will be Dorian Shainin, vice president, Rath and Strong Inc., Boston, Mass. . . .

Joseph P. Napolitano, Jr.

BOSTON . . . June 27, the executive committee met to establish plans for the fall meetings . . .

July 13, the executive committee approved an annual scholarship of $100 for Northeastern University . . .

William E. Grady

CHICAGO . . . The first board meeting was held July 26. Plans for the coming year were discussed and a budget was approved. An innovation was tried and it turned out very successfully. Members desiring to volunteer for committee work were invited to the session. Considerable interest was stimulated.

Oct. 11, first general meeting with Raymond Swenson, formerly of IIT, the noted industrial engineer . . . His topic—QC and Cost Reduction—Two Sides of the Same Coin . . . This will be our first joint meeting with AIIE . . . Mr. Swenson will discuss quality control and cost relationships aimed at the ASQC members present at the meeting . . . He will also cover QC methods applied to Industrial Engineering problems of interest primarily to the AIIE members . . .

The Chicago section's two day training course has been rescheduled for Oct. 26-27. As usual this will present a concentrated survey of QC philosophy and techniques for people interested in gaining knowledge about this expanding profession. For information, call John Dittrich, KE 9-8210, Ext. 370.

Bill Herschberger

CLEVELAND . . . Officers for the 1961-62 season are chairman—Dr. Lloyd S. Nelson, General Electric Co.; vice chairman—Dr. Donald S. Leckie, Republic Steel Corp.; secretary—Samuel H. Troxel, Jr., Ohio Bell Telephone Co., and treasurer—Theodore Ursu, TRW.

N. A. Burkhardt

COLUMBUS . . . Oct. 18, meeting room, IBM, East Broad Street . . . A panel of IBM men will show uses of their equipment in quality control and further augment their remarks with demonstrations of their equipment . . .

From reports gathered, the panel of IBM men have been planning well in advance to present an exceptionally interesting meeting.

M. L. Goeglein

CORNING-ELMIRA . . . Oct. 10, 8 p.m., Lodge on the Green, R. S. Bingham, Jr., Carborundum Co., will present "Informed Customer Product Evaluation Means More Sales" . . .

Officers for the new season are chairman—Larry Lalor, Corning Glass; vice chairman—John Gailey, Corning Glass; junior past chairman—Bob Meyers, Westinghouse; treasurer—Bob Goldsmith, Sylvania; secretary—Joe Sheehe, Westinghouse; program—Dick Melshiemer, Corning Glass; investments—Andy Stergion, Corning Glass; Elmira membership—Marv Kragt, Thatcher Glass; Corning membership—Norb Lauer, Corning Glass; publicity—Jim Davies, Westinghouse, Elmira; publicity and education chairman—Al Erny, Corning Glass; Saddoris Award and scrapbook—Mary McFarland, Corning Glass, and arrangements—Jim Keyworth, Eclipse.

Allan Erny

DALLAS-FORT WORTH . . . July 20, a tour of Mrs. Baird's new automated bakery in Dallas was very well attended . . . 73 members and guests enjoyed an excellent talk on the controls used to assure quality product

WILLIAM J. REED

We are sorry to report that William J. Reed, an old, faithful member of the Albany section, died July 9, 1961.

Mr. Reed worked in the U. S. Navy's inspection office from 1933 to 1958 and, at the time of his death, was quality control director of the Office of Inspection of Naval Material with headquarters at the Scotia Navy Depot.

Mr. Reed always contributed much to any group he was associated with, and we — in the Albany section — will certainly miss his friendship and wisdom.

Chemical Division $3,000 Grant To Expand University of Wisconsin Department of Statistics Library

In September, 1960, the University of Wisconsin established a Department of Statistics with Dr. G. E. P. Box as department head. A graduate program in statistics has already been established with the majority of students drawn from the fields of physics, chemistry and chemical engineering. Dr. Box and several of his students are currently engaged in basic research on the problems of automatic control and optimization of chemical processes in close cooperation with the Department of Chemical Engineering.

In acknowledgement of these events, and to assist the newly formed department, the Chemical Division provided a grant of $3,000 to the University of Wisconsin to purchase a collection of technical journals and reference texts in the general subject area of mathematics and statistics. The books will be housed in the department and each will carry a bookplate bearing the seals of the University and of the ASQC along with the statement, "This book is part of a collection presented to the Department of Statistics at the University of Wisconsin by the Chemical Division of the American Society for Quality Control to commemorate the establishment of the Department and to support the present and future cooperation between the Department of Statistics and the Departments of Chemistry and Chemical Engineering."

Otto Kral, chairman of the Chemical Division, and Karl Bauer, chairman of the Chemical Division Library Committee, made the presentation of the funds. Among those present was Prof. O. A. Hougen of the Chemical Engineering Department who later conducted a tour of the laboratory facilities of his department. Of particular interest to Messrs. Kral and Bauer was the pilot plant equipment presently co-sponsored and managed by the Statistics and Chemical Engineering Departments.

Otto Kral, chairman of the Chemical Division, ASQC, presents a check for $3,000 to Dr. G. E. P. Box, chairman of the recently established Department of Statistics at the University of Wisconsin. Looking on are Karl Bauer, chairman of the Library Committee of the Chemical Division and Prof. O. A. Hougen of the Chemical Engineering Department. The grant will provide a collection of technical journals and books to be housed in the Statistics Department.

in an automated bakery . . . After the tour every one was treated to hot bread and butter . . .

The joint meeting with the Waco section was very interesting. After a good dinner at Leslie's we went to the General Tire Plant for a conducted tour. This reporter and his wife were in a group conducted by Harry Cope, QC manager for the plant and Waco section chairman. They have a very good quality control organization and plan.

R. R. Massegee

DAYTON . . . An executive committee meeting for section officers and committee chairmen was held in late July. Plans for the coming year were discussed, and the groundwork laid for an interesting 1961-62 program of activities. In addition to the regular technical meetings, a plant tour and Ladies' Night have been scheduled, as well as the annual All Day Conference in the spring of 1962. Educational efforts will center around a basic QC course as well as a more advanced course.

Ken Holliday

DELAWARE . . . The year will commence on Oct. 5 with Ladies' Night. Members' wives will be dinner guests of the section.

This year the section will offer clinical sessions in basic statistical quality control and inspection. These sessions will be offered free to inspection personnel of industry located in this area.

The emphasis this year will be on education and membership, and we feel that our capable chairmen Andy Rawicz, George Hall and Bob Fleck will do a very good job in increasing our membership.

James F. Rigney, Jr.

EVANSVILLE-OWENSBORO . . . The first executive committee meeting of the 1961-62 season was held in Evansville to finalize the program for the year. This session resulted in a truly outstanding slate of speakers and two plant tours. The ladies are again invited to enjoy these tours as they have in the past. Of course the season will end with a gala Ladies' Night, but we will be hard pressed to exceed last year's finale. It looks like a good year for the section.

Oct. 19, we look forward to our first joint meeting with ASTME . . . The DoALL Company will present their excellent exhibit on "The Story of the Cutting Edge" at Evansville College Campus . . . This association of two fine organizations has possibilities of a real exchange of technical knowledge . . .

W. E. VerWayne

HARRISBURG . . . Several of the area industries have closed to allow their employees time for their annual vacation. A cross section of the membership showed them enjoying traveling, visiting, swimming, fishing, playing golf, house painting and resting as their means of relaxation. Hope everyone could accomplish or complete the tasks they had planned for this period.

July 10, the executive committee meeeting was held at Borg-Warner, Grantly Road, York, Pa. . . . Education chairman Elmer Kern reported that the Caterpillar Tractor Co., York, Pa., has agreed to allow the Harrisburg section to hold classes at their plant . . .

Arrangements chairman Paul Bucher, membership chairman Chester Conner and program chairman Irvin Bentzel have been meeting with their individual committee members to formulate the new season's activities.

Ann Englehart

HARTFORD . . . Oct. 10 will be the kick-off date for this section's first meeting. It will be held at the Red Coach Grille in Wethers Field at 6:30 p.m. This meeting will be Ladies' Night. A good chance to take them out and also attend the meeting.

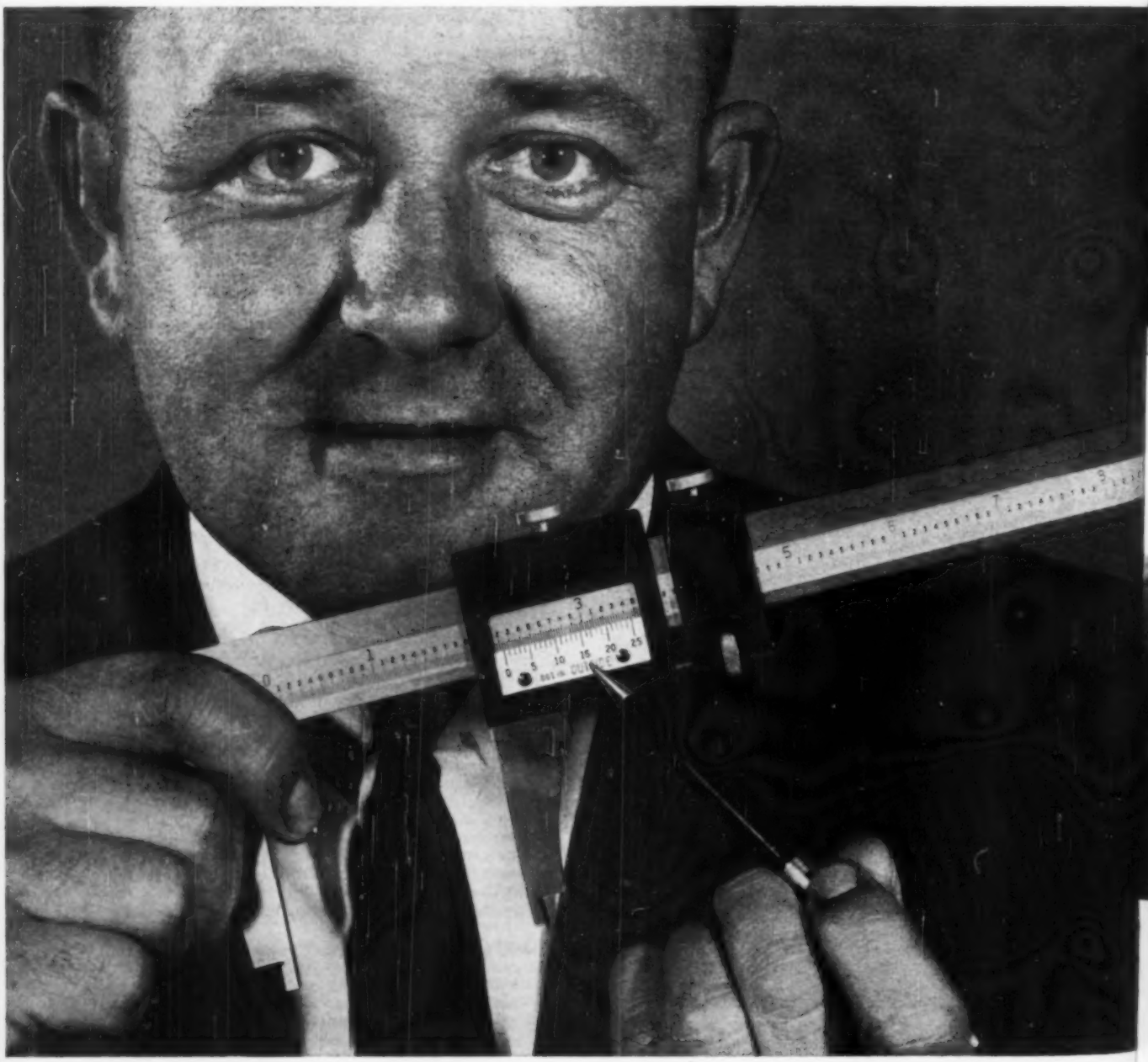
The education committee has come up with five courses in QC beginning Sept. 14 and continuing through December. Course titles and instructors are: Basic Inspection and Gaging—Ken Martin, Precision Measuring

(Continued on page 36)

A "live" demonstration from Brown & Sharpe . . .

"You can see instantly with Brown & Sharpe

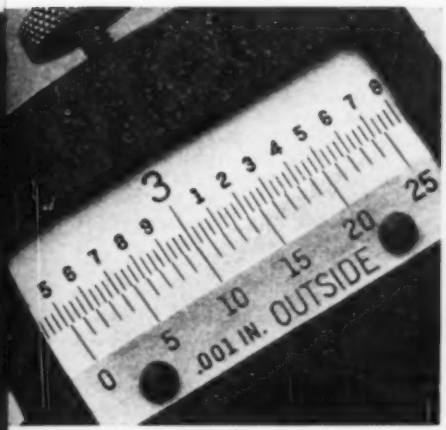
. . . Mr. Norman E. Ashley, General Foreman, Precision Tool



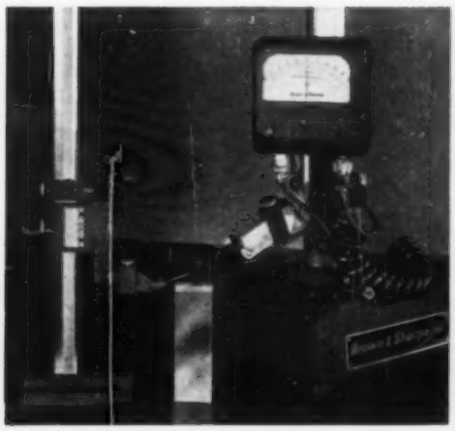
"'Easy on the eyes' is the first big impression you get from a Brown & Sharpe vernier tool. See the black window frame on this B&S Super Vernier Caliper? It centers your eyes on the vernier scale — sets off your reading, loud and clear. What a difference this makes, yet it's just one of several features that make B&S verniers easier to read accurately.

why accuracy comes easier precision vernier tools"

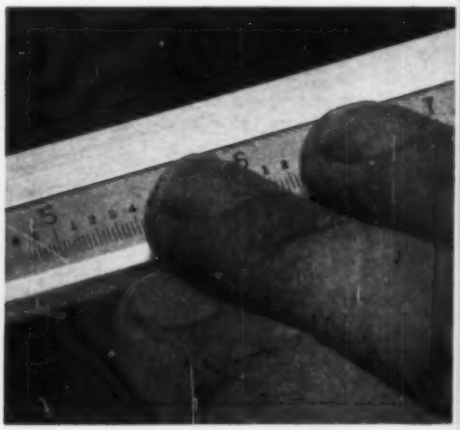
and Gage Groups, Brown & Sharpe, Industrial Products Division



"There's no doubt which line to read, when you work with these widespread graduations. The scale is twice the length of old-type vernier scales — twice as easy to see. Graduations and figures are jet black, machine cut deep into a satin chrome finish that eliminates glare and confusion.

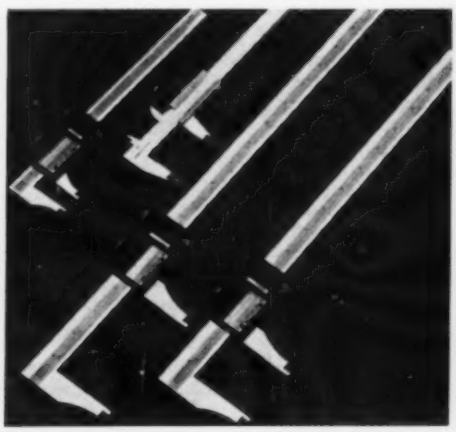


"Your reading is more accurate, too. Brown & Sharpe exceeds Federal Specification GGG-C-111a for tolerances — holds flatness of beams and jaws to .000050". Parts are machined, and assembled precisely. Each tool carries the assembler's personal mark; an added guarantee the tool is right.

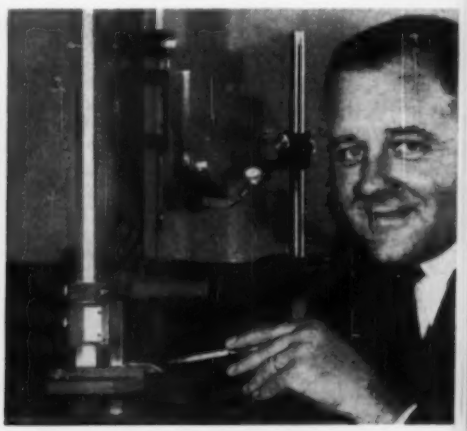


"And, your tool stays accurate longer. Careful hardening, stress relief and a satin chrome finish protect B&S verniers against wear, rust and corrosion. Deep cutting, on a recessed background, makes the graduations and numbers almost impossible to rub off. A real long-term investment!

"Joseph R. Brown, invented this tool, the first practical vernier caliper, back in 1851. We've been adding refinements to it ever since. You can trace the accuracy and convenience of the Brown & Sharpe vernier calipers you buy today — right back through this 110 years of experience.



"Standard sizes of B&S vernier calipers are 6", 12", 24", 36" and 48". We've made specials up to 16 feet in length. They're graduated front and back so you read inside measurements from one side, outside measurements from the other side, directly in .001", with no danger of reading the wrong scale.



"Brown & Sharpe vernier height gages have similar advantages for lasting accuracy and easy, direct reading. You also get an offset arm and slotted base that permit zero reading, plus a 2-way marker for measurement under or over. Call your local industrial distributor for details and prices."

Brown & Sharpe Mfg. Co., Industrial Products Division, Providence 7, R. I.

Brown & Sharpe PRECISION CENTER

(Continued from page 33)

Equipment, Sterling Sales; Basic QC—E. Ellis, QC engineer, Pratt Whitney Aircraft Corp.; intermediate QC—F. Hauman, quality assurance supervisor, Underwood Corp.; Engineering Statistics No. 1—S. Simonvitz, QC engineer, and Engineering Statistics No. 2—L. Sespaniak, operations research supervisor, Pratt Whitney Aircraft Corp.

E. May

INDIANAPOLIS . . . During July section chairman George Blackburn called two executive committee meetings. Participating were newly elected vice chairman Virgil Alexander, treasurer Robert Fallowes, secretary Theodore Meserve and directors R. D. McNeff, Dr. H. L. Breunig, K. L. Flanagan, and H. M. Handerson. Honorary advisors for the year are Arthur Bender, Jr., Carl Hoover and John Waldner.

Section assistance was pledged in the Boy Scout Explorer Pack Project (Jack Bussell, education chairman), and a delegate sent to the Joint Engineering conferences (Ralph Scherschel, Inter-Society Relations chairman).

This year's program was approved as developed by program chairman Foug Arvidson and committeeman Ray Brown (program 1962-63). Whenever possible there will be a "What's Your Problem-" session before the main event, with the group meeting between 6 and 7 p.m. in the Faculty Dining Room at Butler University.

Oct. 10, our speaker is Dr. Harry Smith, statistical research supervisor at Proctor & Gamble . . . His topic "Management Problems—Decision Making" . . .

The next general committee meeting is Oct. 24.

Mel Handerson

KANSAS CITY . . . Section officers for the 1961-62 year have announced the following committee chairmen appointments: membership—Julius E. Verebelyi, Western Electric; reception—Warren T. Hornsby, Hallmark Cards; professionalism—John C. Tepper, Western Electric; examining committee—Jay R. Rumberger, Bendix Corp. Other appointments include section newsletter editor—Robert D. Hill, Bendix Corp.; section historian—John B. Cobb, Standard Oil; Saddoris Award—David R. Stevenson, Bendix Corp.; and Midwest Conference Board representative—Robert F. Cell, Bendix Corp.

V. J. Smeltzer

LIMA . . . Oct. 6-7, intensive course in reliability sponsored by the Lima section . . . Harmon S. Bayer, QC Consultant, Detroit, Mich., will be the instructor . . . For information contact D. C. Fultz, Lima Engine plant, Ford Motor Co., Lima, Ohio . . .

C. J. Dukro

LOS ANGELES . . . July 22, the Inspection Division of the Los Angeles section held an inspection workshop which attracted more than 500 professional and technical QC people from every California section . . .

J. N. Paulson, QC director, Aero-Space Division, Boeing Airplane Co., highlighted the morning with his talk on "Quality Control for Large Industries." The Aero-Space Division is very active in the Minuteman Program.

The Inspection Division monthly meeting at IAS proved very interesting with a panel on "A Good Look at Inspection." Steve Kozich, QC manager, American Electronics, covered the parts with his first article, "Inspection System," while Ben Cogan, quality assurance manager, Ramo-Woolridge Corp., covered the people and why inspectors are like the way they are with his talk on "The Troubles with Inspection."

S. Kozich

LOUISVILLE . . . The final executive meeting of the summer was held at General Electric's Appliance Park with twelve members present. It was voted at this meeting to purchase a plaque for the listing of all past chairmen of the section and the year in which they served.

A course in quick methods of Quality Control Analysis is scheduled for the third week of September. The first issue of the Louisville section News Letter will be printed in August, which will include the program for the coming season.

Monroe J. Oates

MERRIMACK VALLEY . . . At the last executive committee meeting, James King was named representative to the New England Council.

Fred Ryan

METROPOLITAN . . . The month of July saw two meetings of the newly elected officers of the section acting as a task force, in conjunction with the program chairmen, to finalize the year's program.

In addition to the regular yearly Buzz Session, a plant tour of the new semi-automated Family Machine Division of Singer Manufacturing Company is planned, plus a program at the United Nations under the sponsorship of the United States Mission to the United Nations.

Programs involving case studies, industrial psychology and the use of computers in quality control are among some of the events planned for the coming year.

The following new committee chairmen were appointed for the 1961-62 season: Saddoris Award—W. I. Martin, Price Waterhouse Co.; publicity—T. D. Sansone, Ward Leonard Electric Co., and arrangements—A. A. Palazzolo, Sonotone Corp.

J. O. Cully

MONTREAL . . . Oct. 28, Fifth Annual All Day Forum, Ecole Polytechnique, 2500 Marie Guyard St., with the theme "Quality Control Increases Productivity" . . .

Experts from the United States and Canada will cover such topics as basic concepts, statistical methods in food processing, in-plant training, QC in the foundry, practical applications of probability paper, analysis of variance, sampling, reliability, and intramural quality relationships.

A session on labor and management has also been arranged.

The luncheon speaker will be V. O. Marquez, vice president and general manager of the Sales Division, Northern Electric Co., Ltd., and his subject will be "Some Problems in Modern Day Competition."

J. Fitzsimons

High Limit Accidental Death And Dismemberment Coverage Added to Group Insurance

A new plan of High-Limit Accident Insurance covering death, dismemberment and permanent total disability was recently approved by the Society's Board of Directors as an addition to the ASQC Group Insurance Program.

This new plan will offer coverage to a maximum of $200,000 in units of $25,000 at an annual cost of 90 cents per thousand dollars for members under 70. The cost for members over age 70 will be $1.35 per thousand dollars with maximum coverage of $100,000. $25,000 protection will also be available to spouses of members. During the Charter Enrollment Period of 90 days, (ending Nov. 15, 1961) all members and their spouses under age 75 may apply.

There will be no health requirements for coverage of $100,000 or less.

The new plan covers accidents around the clock including accidents at home, at work, and on vacation, and is not confined merely to travel. Coverage is written by the Continental Casualty Company which underwrites the other plans in the Program.

A brochure containing full details of this new coverage was mailed to members in June. Questions regarding the coverage should be addressed to Administrator, ASQC Group Insurance Program, 1120 Connecticut Avenue, N.W., Suite 920, Washington 6, D.C., rather than to the Society.

GREATER MUSKEGON . . . Oct. 12, after a fish and shrimp dinner, a joint meeting with the Grand Rapids section will be guests of the Brunswick Corp., Muskegon, Mich., for a plant tour of the recently built automatic pinsetter plant with A. S. Papp, QC manager, as host . . .

The plant itself is as modern as the machines inside. It was chosen one of the top plants of 1960 by **Factory Magazine,** a publication for manufacturers. Among many features is the plant's expandable design and flexibility between the storage and production areas.

The latest methods and equipment are used in Process Inspection during the manufacturing of automatic pinsetters.

A fine turnout is expected from both sections and will contribute to the success of this plant visitation.

Albert Baker

ORANGE EMPIRE . . . July 20, "Introduction to Aeronutronics" was the title of an address by L. H. Brennwald at a dinner meeting held in the dining room of the new Aeronutronic facility at Newport Beach, Calif. . . .

Mr. Brennwald, manager, Technical Support Staff, was introduced by this section's new chairman, Ed Steinmeyer, and gave a very interesting talk on the purpose and goals of the facility and the manner in which they are to be achieved.

The Emmy award winning film **This is Aeronutronic** was presented which traced the birth of this multi-million doliar facility from the initial Spanish land grant to the present ultra modern engineering and research center.

Coordinator for this very fine program, Tom Hand, is to be congratulated for a job well done.

This meeting was the first in a new series featuring the various manufacturing and research companies in the Orange County area and has generated considerable interest in the section.

Henry W. McKee

PARKERSBURG . . . A plant tour of Carborundum metals is tentatively scheduled as the regular November meeting. The tour is planned for the first week in Nov.

The section is planning a cook-out and get acquainted meeting early in September. This meeting will open the 1961-62 season for the Parkersburg section.

Robert R. Stewart

SACRAMENTO . . . Starting Monday, Oct. 2, and continuing through Monday, Nov. 13, a training course will be conducted under the sponsorship of the Sacramento section. This seven week course consisting of seven two hour sessions is titled "Industrial Quality Engineering" and covers the development of the principles of quality engineering from the construction of the Egyptian pyramids to the present day. It will emphasize the increasing importance of the quality engineer in a variety of enterprises.

M. K. Walker

SALT LAKE CITY . . . The section held their last meeting May 25, and then discontinued holding meetings for the months of June, July and August. The meetings were not held primarily because of the effect that summer vacations have on meeting attendance. Our next meeting will be held in Roy, Utah.

David M. Stewart

ST. PETERSBURG-TAMPA . . . The section held its final meeting of the year on July 1, 1961. Thirty members and prospective members attended the social meeting aimed at acquainting the prospective members with the local section. C. French, General Electric Co., gave a short talk on the history of ASQC. The talk was followed by a social gathering at which beer and chips were served.

D. Ackerman

SAN FRANCISCO . . . Aug. 3, the first meeting for the new season was held at Dell Webb's Townhouse in San Francisco . . . It was Management Night with a "Bring Your Boss" theme . . .

The speaker was Len Seder, a QC Consultant from Malden, Mass., who was the ASQC Brumbaugh Awardee

"The UNIVERSALITY of STATISTICS"

STATISTICS and:
Baseball—Stock Market—Warfare
Weather—Gambling—Medicine—
Crime—Sociology

★ **Statistics are used universally. But when's the last time you had a chance to see how they are used in other fields.**

Hear experts in Quality Control and the above areas; then adapt their techniques to your problems. ★

★ **There'll also be a top-notch training program on:**
Basic and Advanced Q.C. Techniques
Life Testing and Reliability
Section Management

(See page 20 for speakers and topics.)

16th MIDWEST QUALITY CONTROL CONFERENCE

OCT. 19-20, 1961

Chase-Park Plaza Hotel • St. Louis, Mo.

Mail Registration to:
H. T. Bock
Olin-Mathieson Chemical Corp.
East Alton, Ill.

ASQC Members Fees

Tech. Sessions:	Two days	$25.00
	One day	15.00
Training Courses:	Basic	30.00
	Advanced	30.00
	Reliability	40.00
	Section Management	10.00

Non-Members: $5.00 additional.

Make Checks payable to: 16th Midwest Quality Control Conference, ASQC

Name .....

Address .....

Starting the 1961-62 year by planning for three straights in the Saddoris Award competition are, from the left: R. Calvert Haws, Quality Control Engineers, Inc.; Gordon Drake, Ordnance Corps, U. S. Army; Leo A. Aroian, Space Technology Laboratories; Donald R. Andree, Radio Corporation of America; Henry I. Matosoff, Cannon Electric Co.; Louis M. Buhlrer, Vard, Royal Industries; Howard C. Todt, North American Aviation, Inc.; Guy V. Hutchins, Office, Inspector Naval Material, U. S. Navy; Raymond A. Dotey, Ordnance Corps, U. S. Army; Robert L. Heath, Rocketdyne Division, North American Aviation, Inc.; John W. Young, North American Aviation, Inc.; Edward P. Coleman, University of California; E. Jack Lancaster, Ballistic Systems Division, U. S. Air Force; E. C. Bennett, Northrop Corp.; Irving Quart, Norair Division, Northrop Corp.; William E. Drees, Dale Electronics; G. W. Austin, Rocketdyne, North American Aviation, Inc., and Steve Kozich, American Electronics, Inc.

Los Angeles Section

in 1950. Attendance at this meeting was excellent with several top management people in attendance. The arrangement committee headed by Paul Hile is to be congratulated on the excellent arrangements made for this meeting.

Oct. 10, Old Plantation, Los Altos, Calif., B. L. Lubelsky, manager, Polaris Reliability from Lockheed Missiles and Space Division, Sunnyvale, Calif., will present "Reliability in the Polaris Missile System" . . .

Thomas L. Russell

SANTA MARIA-VANDENBERG . . . No scheduled section meeting during July. July 25 meeting of committee chairmen to plan activities.

Section officers are chairman—George E. McFadden, Air Material Command, Vandenberg AFB; vice chairman—Jack W. Kern, Douglas Aircraft Co., Inc.; secretary—James O. Shippen, Lockheed Missiles and Space Division, and treasurer—Anthony Helit, General Astro Dynamics.

Committee chairmen are program — Marshall F. Thomas, Douglas Aircraft Co.; membership and examining—Russell W. Barnes, Air Material Command; auditing-educational—John M. Aldrich, Douglas Aircraft Co.; arrangements—James D. Fallon, Douglas Aircraft Co.; special events—Harry L. Hines, Air Material Command; Saddoris Award and publicity—Victor E. Johnson, Douglas Aircraft Co., and professional development —Jim Elder, Boeing Airplane Co.

Oct. 24, meeting at the Los Flores Inn, Santa Maria, Calif. . . . Guest speaker will be Glen Ghormley, Fellow, ASQC . . . The subject will be announced . . .

Victor E. Johnson

SAUL BRODSKY

On August 7, the Toronto section was saddened by the death of one of its most active members, Saul Brodsky.

Mr. Brodsky, 42, was a professional engineer employed in the Quality Control Department of Canadian General Electric Co. Ltd. He was a past president of the National Zionist Association and very active in the Zionist community.

His activities in the Toronto section included section treasurer, 1959-60; chairman of the 1959 Forum committee; secretary, 1960-61, and vice chairman, 1961-62.

Mr. Brodsky's contribution of effort to the Toronto section will be greatly missed by all members.

SOUTH BEND-MISHAWAKA . . . Oct. 19, a plant tour has been arranged through the courtesy of E. A. Lefrow of the Packaging Corporation of America . . .

We will also have a second speaker, Robert Clark, QC manager, Johnson & Johnson, on "Quality Evaluation for Top Management."

Fred M. Ahrens

SOUTHERN CONNECTICUT . . . The October meeting will be held at the Barden Corp., Danbury, Conn. John J. Riley will be host. A plant tour is planned. Dinner arrangements will be prepared for those wishing to dine in Danbury before the meeting. Please contact Isador Levine, CBS Laboratories, Stamford, Conn., for additional information.

William E. Wells

SYRACUSE . . . June 20, Annual Installation Dinner Dance . . .

Highlight of the evening was the installation of Willard West as section chairman and William A. Young as vice chairman.

The section is working with the Utica section in the planning of a fall conference to be held in Utica, N.Y.

F. A. Bullard

TOLEDO . . . Summer committee meetings in the Toledo section are considering methods of assisting local industry in the development of quality control and also ways of reaching potential members through program announcements and section members in each company.

R. E. Rockwell

WACO . . . July 28, the section hosted the Dallas-Fort Worth section with a dinner meeting and plant tour of the General Tire & Rubber Company's Waco plant . . . The members and their wives, who were guests, enjoyed the plant tour and a short talk by Harry Cope, the plant's QC manager, on "A Cookbook Version of How a Tire is Made" . . .

Harold C. Waite, district representative for Brown & Sharpe Manufacturing Co., will be the section's October speaker. His topic—Back to the Basics in Precision Measurement—will emphasize the part played in industry by the inspector.

A six week, twelve hour, short course on "Basic Concepts of Quality Control" will be presented from Oct. 23 through Nov. 27. The course will be directed toward industries which have recently started QC departments. The course will be presented by the section members with one or two guest speakers supplied by the Dallas-Fort Worth section.

Jon L. Tankersley

WASHINGTON, D.C. . . . It appears that in planning the forthcoming year, the section officers have taken great pains to provide a stimulating and challenging

program for the rapidly expanding membership. Among the more interesting events scheduled are sponsorship of the Middle Atlantic Conference, which will be held Mar. 8-9 at the Statler-Hilton Hotel, Washington, D.C.; co-sponsorship of a conference on reliability requirements for semi-conductor device specifications, to be held Oct. 25-26 at the Department of the Interior auditorium, and a continuation of the outstanding training programs which have been conducted over the past years.

M. Alethia Mayes

WESTERN MASSACHUSETTS . . . Oct. 10, first meeting of the new season at the Sheraton Motor Inn, Springfield, Mass. . . .

In lieu of the regular meeting for the month of September, a one day quality assurance educational program was scheduled.

Alan J. Donnelly

YOUNGSTOWN . . . Willard Cheek, senior research physicist, General Motors Corp., Research Laboratories, Warren, Mich., is scheduled to be the guest speaker for the opening of the 1961-62 season. His topic—The Ropes of the Past Ring the Bells of the Future.

Eugene Passell

Significant Differences

. . . ALBANY — **Charles Grace** has moved to Pittsfield. Mr. Grace has been a faithful member for many years and will be missed by all of us. This is our loss and Pittsfield's gain. The best of luck to you in your new job and home!

. . . ALBUQUERQUE — **L. J. Paddison,** director of Product Test Equipment Development, Sandia Corp., has been named national chairman of the IRE Professional Group on Reliability and Quality Control. Membership in this group is worldwide and comprises about 1800 members. The group is interested in principles and practices used in reliability and quality engineering of electronic products. Mr. Paddison has been a member of the professional group since 1952 and has served as national vice chairman for the past six years. Within the past 14 years Mr. Paddison has headed Sandia's Quality Assurance and Reliability organizations in addition to his present position. During World War II he was active in research and development work on the Navy VT Fuze at the Applied Physics Laboratory, Johns Hopkins University. Mr. Paddison worked on a Navy contract at New Mexico School of Mines for a year prior to joining Sandia's staff.

. . . ALLENTOWN-BETHLEHEM — **Miss Bonnie Small,** Western Electric Co., has been reassigned to the Princeton Research Center of Western Electric Co., Princeton, N. J.

Bob Tust, Western Electric Co., Allentown, has completed the QC engineering course sponsored by the ASQC Training Institute and conducted by General Electric Co., West Point, N. Y.

Bob Horstman, Rodale Co., Emmaus, Pa., has accepted the task of reporting section activities to **IQC.** He will be grateful to you if you will advise him of any newsworthy occurrences.

. . . BOSTON — **Howard L. Stier** has been named director of quality control, United Fruit Co., with headquarters at the Company's General Office in Boston, Mass. This is a newly created position and is part of the Company's overall reorganization aimed at increased efficiency and improving earnings. In commenting on Dr. Stier's appointment, **John M. Fox,** executive vice president, United Fruit Co., said "Quality assurance is one of the most important aspects of our new marketing program. We know that quality bananas can be sold at a premium and by assuring consistent quality a further premium is possible. This, added to potential savings made from the grading of marketable fruit in the tropics, should result in increased sales and significantly higher banana profits for United Fruit."

For the past ten years, Dr. Stier has been director of the Division of Statistics, National Canners Association, a position which involved economic and marketing studies, quality control and the analysis of experimental data. While at NCA he also served as a professional lecturer in managerial statistics and quality control at George Washington University. Prior to his association with National Canners, Dr. Stier was Professor of Marketing and head of the Department at the University of Maryland, College of Agriculture.

During World War II, Dr. Stier served as chief statistician of the U. S. Army Quartermaster Corps and director, Progress Analysis Division, War Assets Administration, and was discharged in 1946 with the rank of colonel. He was awarded the Legion of Merit for his wartime service.

. . . CHICAGO — An excellent, new reliability training course will be sponsored by the Electronics Division, ASQC, and local members of the IRE. It will begin Sept. 30 and consist of 12 three hour sessions on Saturday mornings. The Chicago section, ASQC, although not directly a co-sponsor, is cooperating and assisting wherever possible. For information, call **Martin Joseph,** KE 3-6700, Ext. 501.

Division Best Paper Award To Norbert L. Enrick

The Best Paper Award for 1961, Textile and Needle Trades Division, ASQC, was presented Feb. 18 to Norbert L. Enrick during the Eleventh Annual Textile Division Conference, Clemson House, Clemson, S.C.

Mr. Enrick is with the Graduate School of Business Adminstration, University of Virginia, Charlotesville, Va.

The paper, "Variations Flow Analysis," was Published in *Technometrics*, Vol. 2, No. 3, August, 1960. The paper has applications in a variety of processing applications.

The award itself is a handsome two-pen desk set with the inscription "Best Paper Award 1961, Textile and Needle Trades Division, ASQC."

A book by Mr. Enrick, *Quality Control* (Fourth Edition, 1960) by Industrial Press, N. Y., was recently published in the German language under the title *Qualitatskontrolle im Industriebetrieb* by R. Oldenbourg Publishing Co., Munich, Germany, and Vienna, Austria.

The translation is by Ruth Masing and Dr. Walter Masing. Dr. Masing is past president of the German Quality Control Society (*ASQC—Arbeitsgemeinschaft fur statistische Qualitaetskontrolle*).

Mr. Enrick was recently appointed chairman of the subcommittee on sampling and statistical evaluation of Committee D-13 of the American Society for Testing Materials.

Variations Flow Analysis is a technique of evaluating the transfer of variations in stock, when the product from several machines at one processing stage is fed randomly to the several machines of the succeeding stage. This paper describes procedures, based on modifications of range methods for analysis of variance, which have been found of value in a large number of applications. The methods are illustrated with examples from yarn manufacture.

SPEEDMIKE...

DIRECTLY READ

TWICE AS FAST

ERROR PROOF

NOW ONLY $31.00!

J. T. SLOCOMB COMPANY

Matson Hill Road • South Glastonbury, Conn., U.S.A.

I'M INTERESTED! SEND ME . . .

☐ the name of my nearest Speedmike distributor.

☐ your free new literature describing the Speedmike in detail.

NAME: _____

TITLE: _____

COMPANY: _____

ADDRESS: _____

Slocomb — Fine Micrometers Since 1891

. . . COLUMBUS — **John R. Sneeden,** formerly with Kilgore, Inc., Westerville, Ohio, is now with the Bennett Manufacturing Co., Westerville, Ohio, as production manager.

M. L. Goeglein, previously chief inspector at the Columbus Auto Parts Co., has been promoted to superintendent of the Forging Division of this company.

. . . CORNING-ELMIRA — A newcomer to the Corning Glass QC team is **Bill Reinke,** graduate Ph.D. in mathematical statistics from Western Reserve. Off and running will be **John Gailey** and **Bill Barker** to the new CGW Danville, Va., plant. "Kentucky" Bill said that he'll be glad to be back in God's Country. An unbiased opinion, of course.

. . . DALLAS-FORT WORTH — Section director **Robert A. Glover,** formerly of Ling-Temco, has moved to Denver, Colo. He has taken employment with Martin-Denver.

. . . DAYTON — **Bob Stockert,** past chairman of the Dayton section, will serve as counselor for District Eight, Aircraft and Missile Division, ASQC.

. . . DELAWARE — Best of luck to **Bill Hirnyk** on his new job in Chicago.

Welcome to **George Hall** who comes to International Latex from Maxwell House Coffee in Texas.

. . . EVANSVILLE-OWENSBORO — We feel the loss of **Harry Musgrave's** activity in our section since he has moved to a fine position in Arkansas. Harry was not only our treasurer, last year, but the finest teller of tales in the organization. Our loss will certainly be another section's gain.

. . . HARRISBURG — **N. R. Lupold,** Caterpillar Tractor Co., York, Pa., will be leaving this section to be associated with the Corning Glass Works in Bradford,

The DoALL Company to Present The Story of Productivity

Major events that began with the Industrial Revolution and brought man to his present state of material welfare have been compressed into a 46½ foot long traveling educational exhibit that begins a three-year tour of the country in September. It will be shown before engineering societies, civic, management and educational groups.

The exhibit is the fourth of its type created within the past decade by the DoALL Company, a leading producer of machine tools, cutting tools and precision measuring instruments.

Called "The Story of Productivity," the display is built around a "sunburst" eight feet in dia. that records in ten classifications 157 major events that ushered in man's age of abundance. This "sunburst" is an exact replica of the 30-ft. original in DoALL's permanent exhibit, "The Dawn of This Age," in the Hall of Progress at its general offices in Des Plaines, Ill.

A lecture describing and coordinating the events in the "sunburst" to point up how the foundation was laid for today's era of high productivity comprises the first half of the presentation. Speaker is C. G. Schelly, DoALL's Director of Educational Research.

The three previous DoALL traveling exhibits have been presented throughout the country since 1954 to more than 75,000 persons in 500 separate performances. These three exhibits, "Civilization through Tools," "The Story of Measurement" and "The Story of the Cutting Edge," traced the evolution of tools, measurement and cutting edges and the part they have played in raising man to his present high standard of living.

Pa. Nels served as examining committee chairman for the 1960-61 season. Good luck to you, Nels!

Mariott B. Fasnacht, formerly of Lancaster and also a section member, has left his post at Bendix Corp., York, Pa., to become head of the QC department for the HRB-Singer Inc., State College, Pa.

. . . HARTFORD — **Ken Martin,** formerly QC manager, Veeder Root, is now with Sterling Sales as sales representative in Precision Measuring Equipment.

. . . INDIANAPOLIS — **Dr. E. E. Blankenstein,** chief, inspection methods and process control engineering, retired July 1 and after 38 years with Western Electric Co. He was replaced by **J. R. (Jim) Signorino,** who has enjoyed a varied experience in other engineering assignments after serving in SQC with **Dr. J. M. Juran** at Western Electric's Hawthorne Works in the Thirties.

New chairman for the section examining committee is **Henry Jacobson**, Consultant, with committeemen **Tom Turner,** national director, and **George McDermott,** State Senator.

New membership chairman is **Paul Kuhn,** Bell Telephone Laboratories, phone FL 6-8811, Ext. 2176.

Joseph L. Ruggieri, area delegate for Bloomington, has been promoted to assistant QC manager, Sarkes Tarzian, Inc.

Carl D. Larson, General Tire and Rubber Co., has been named area delegate for Logansport, Ind.

Marquand Ransome, Cummins Engine Co., is the new area delegate for the Columbus contingent.

. . . STATE UNIVERSITY OF IOWA — Appointments of committee chairmen were made by section chairman **Everett E. Lawson** of Philco Corp., Dexter Division, as follows: program — **Gerold J. Narigan,** State Industries; membership — **Paul L. Piskel,** Collins Radio Co.; publicity — **John Miller,** French and Hecht Division, and Saddoris Award — **Ronald D. Hughes.**

. . . KANSAS CITY — **W. L. Beumer** recently joined the Gordon Johnson Company as a quality control engineer.

A recent addition to the quality division of the Bendix Corp., Kansas City, is **Robert W. Weeks.**

The section lost **William G. Atwater** who moved to California and will be working for Hughes Aircraft Co.

W. D. Gay and **V. J. Smeltzer,** Bendix Corp., were transfered to the Manufacturing Division from the Quality Division.

. . . LANSDALE — New officers for the 1961-62 season elected during the April meeting are chairman — **G. Casey,** R. French; vice chairman — **R. Scholl,** U. S. Gage; secretary — **K. Dwyer**, U. S. Gage, and treasurer — **C. Garrett,** Dana Corp. With the election of these officers, the Lansdale section will endeavor to have an interesting and successful year.

. . . LOS ANGELES — **J. N. Paulson** met Mervin Paulsen at the inspection workshop. Mr. Paulson is QC director, Aero-Space Division, Boeing Airplane Co., and Mr. Paulsen is quality representative at American Electronics, for Aero-Space Division, Boeing Airplane Co.

The Los Angeles section, including Division meetings, inspection workshops and the reliability symposium, attracted 8,625 members and guests for a monthly average attendance of 719. The Los Angeles section submits this as a new record for attendance.

. . . MINNESOTA — **Gerald Miller,** formerly with the Toni Co., is now an employee of Minnesota Mining & Manufacturing Co., St. Paul, Minn. His job is QC engineer in the Gift Wrap and Fabric Division. Good luck — hope you like your new job!

Richard R. Carlson has been appointed QC manager by the Scott Division, McCulloch Corp., Minneapolis, Minn. Mr. Carlson has been with the company since 1956.

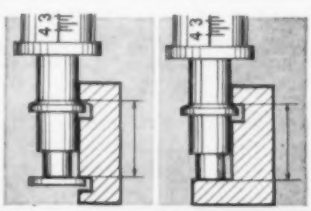
NEW TRUARC GAGE LOCATES BEVELED, RECTANGULAR GROOVES

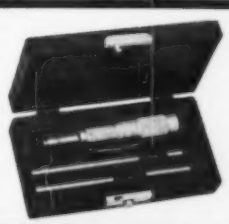
Measures distances 0.4″ to 1.4″ from outer wall of groove. Extensions increase range to 11″

The Truarc Groove Location Gage is a unique new micrometer gage which provides an accurate and economical means for measuring the location of beveled and rectangular retaining ring grooves, O-ring grooves, oil grooves, thread reliefs and other recesses. It may be used for internal grooves in bores or housings and external grooves on shafts and similar parts.

A special attachment, included at no extra cost, forms an artificial shoulder where none exists in the part being checked. The attachment is ideal for measuring distances between two grooves.

Two typical groove measurements for which the gage is designed are shown below. For complete details, write for Data Bulletin No. 459-10.





AVAILABLE FROM STOCK AT THESE LOW PRICES:

Truarc Groove Location Gage: $42.50
Set of four extensions: 24.00
Fitted case*: 4.75

Gages and/or extensions purchased without fitted case are supplied in plastic tubes.

WALDES TRUARC® RETAINING RINGS

WALDES KOHINOOR, INC.
47-16 Austel Place, Long Island City 1, N. Y.

. . . OMAHA-LINCOLN—**Niles Hutton Barnard,** Fellow and member of the ASQC Brumbaugh Award Committee, 1956 to date, has been nominated to serve for a two-year term as vice president of the American Society of Mechanical Engineers, Region VII.

In addition to this office, in April, 1961, he was also named president-elect of the Nebraska Engineering Society. He will take office in April, 1962.

Mr. Barnard is a professor and is assigned as chairman of the department of mechanical engineering, University of Nebraska, Lincoln, Nebr.

. . . ORANGE EMPIRE — **Ray C. Beamon,** chairman, Saddoris Award Committee, has been promoted to superintendent of Quality Assurance, Nortronics Systems Support, Anaheim, Calif.

Al E. Candelaria, former chief of quality control, Norden Co., is now quality assurance representative, Philco Corp., Palo Alto, Calif. He has resigned as section treasurer to assume his new position at Palo Alto.

Bill Bredenbeck, Robertshaw-Fulton Co., has been selected to complete the term as section treasurer.

John W. Clark has changed positions and is now quality assurance representative at Hughes Ground Support Systems, Fullerton, Calif.

William B. Nelson, section secretary, has been promoted to superintendent of quality assurance, Nortronics Systems Support, Anaheim, Calif.

Nondestructive Testing Equipment Given to Sacramento State College

A gift of highly technical nondestructive testing equipment has been presented to Sacramento State College by Sperry Products Co., Danbury, Conn., a division of Howe Sound Co. (NYSE), metals manufacturer.

This gift, plus additional equipment purchased from Sperry and some already owned by the school, gives Sacramento State the broadest, most comprehensive nondestructive testing training and engineering facilities of any school in the country.

The formal presentation was made by Philip J. Parker, Sperry sales manager, to F. Blair Mayne, executive dean, Sacramento State College.

Ceremonies were conducted in the Division of Engineering headed by Edwin B. Weinberg, chairman, Engineering Division, and Dr. George N. Beaumariage, Jr., faculty member responsible for research and development, Engineering Division.

Dr. Beaumariage is also director of the Institute of Nondestructive Testing.

Robert Oliver, national president of the Society for Nondestructive Testing, participated in the ceremonies and Douglas Ballard, Sandia Corp., gave the opening speech.

Two new buildings have been constructed specifically to house this relatively new science—one building devoted entirely to radiography and the other to be used for all other nondestructive testing facilities . . . ultrasonic, magnetic particle, penetrants, eddy current, optical testing, etc.

Dr. Beaumariage said the college now plans an integrated facility for non-destructive testing. The college hopes to develop a Bachelor of Science degree in Material Science Engineering and offers all requirements for a Bachelor of Science in Mechanical Engineering.

The Sperry gift includes the latest in ultrasonic Reflectoscopes and accessories, ultrasonic positioning equipment for immersion testing, large Sonoflux magnetic particle testing machine with black light and portable magnetic particle testing units and accessories.

. . . SACRAMENTO — A welcome is extended to the following new members: **D. W. Blosser, P. E. Cowdin, W. R. Gibson, W. H. Kreipke Jr., L. W. Lepkowski, C. H. Minter, G. Mouradian, H. L. Sullivan, C. K. Tomb, L. S. Wilcox, R. H. Wray, L. E. Zwissler.**

Congratulations are in order for **H. Benenson** as he takes the supervisorship of Data Collection and Analysis for the Polaris Quality Assurance Department at Aerojet-General Corp.

. . . ST. PETERSBURG-TAMPA — **H. P. Stadnik,** section past secretary, is ill and in the hospital. Get well quick, Henry!

. . . SAN FRANCISCO — We would like to welcome **Richard Coleman** to the Bay area. Mr. Coleman was recently transferred from Gerbers, Rochester, N. Y., to Oakland.

Gladyn H. Putt has been appointed director, Quality Assurance and Test Service, for Lockheed Missiles and Space Division, Sunnyvale, Calif.

Gordon Everett, formerly QC section chief for Gerber Products, has transferred to American Home Foods, Oakland, Calif., as QC director.

Dan Stutzman has been promoted to section chief, Gerber Products, replacing Mr. Everett.

The section would like to welcome **Dr. Gerald J. Lieberman** back to the Bay area. His support for local ASQC activities was greatly missed.

. . . SANTA MARIA-VANDENBERG — Our section number has been changed to 0601 from 1602.

Loyd Gastineau and **Jim Elder,** Boeing Airplane Co., transferred into our section from the Pensacola-Mobile section.

. . . SOUTH BEND-MISHAWAKA — **Ralph Buccafusco,** formerly of General Tire at Logansport, Ind., has transferred his membership from this section to the Boston section. Mr. Buccafusco is now employed by Acushnet Process Co., New Bedford, Mass.

. . . SOUTHERN CONNECTICUT — The section is very pleased to report that **Jack Kidwell,** QC director, Lycoming Division, Avco, has now been appointed national chairman of the Reliability Engineering Technical Committee.

. . . TOLEDO — **Ralph Jones,** an Air Force inspector, has been transferred by the Air Force from Aero Equipment Co., Bryan, Ohio, to Mesa, Ariz.

. . . WACO — **Don H. Barrett,** education and training committee chairman, has made plans with Baylor University to hold the section's first training course of the year in the newly dedicated Hankamer Building in the School of Business.

. . . WASHINGTON, D. C. — **Dr. Chester H. McCall, Jr.,** section chairman, a former project director with the Washington office of Booz-Allen Applied Research Inc., has been promoted to research director, statistics, in charge of the firm's statistics staff.

Booz-Allen Applied Research, Inc., national scientific and technical consultants with Washington, D.C. offices at 4815 Rugby Avenue, Bethesda, Md., has promoted the following senior staff member in the Washington office to research director.

D. Alan Kendall has been promoted to research director-program control. He has had extensive consulting and work experience in aeronautics, facilities engineering, production control, and has many years of experience in the control of technical programs. Prior to joining BAARINC, he was with the management consulting firm of Booz, Allen & Hamilton, an associated organization. He has also worked in the aircraft industry as an analyst, chief industrial engineer, production manager, and planning and scheduling manager. Mr. Kendall attended the Johns Hopkins University and St. Olaf's College.

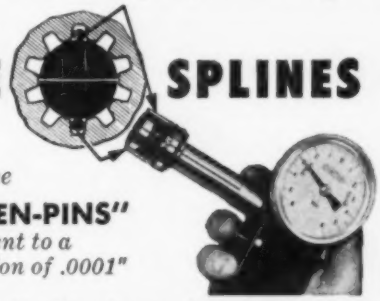
. . . YOUNGSTOWN — **Charles E. Weitz Jr., Charles R. Branfield** and **Donald C. Burklo,** section members, attended the District Eight section officers meeting arranged by the Cincinnati section on June 17. The meeting was held in Hotel Sheraton, Cincinnati, Ohio.

10 times faster than a surface plate. No reference standards are required with the Sheffield-Ferranti machine for measuring and laying out location of holes and surfaces to X and Y coordinates. Part tolerances of .001 and larger are indicated to the nearest .0005 with direct visual readout in lighted ¾" numbers. Instant zero reset—working range 15" x 24". Save time by rushing request for Bulletin FI-22.

The **SHEFFIELD** *Corporation • Dayton 1, Ohio*
A subsidiary of The Bendix Corporation

At last . . . a simplified way to

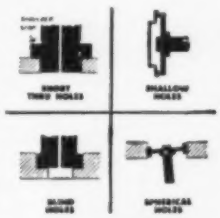
GAGE SPLINES



with precise
"BETWEEN-PINS"
measurement to a fraction of .0001"

COMTORPLUG with interchangeable expanding plugs to gage simple or special holes from ⅛" to 10" dia.

Insert into your spline or internal gear the unique expansion plug equipped with gaging wires . . . let it expand to firm contact . . . and you see the exact between-pins size shown in large graduations easily readable to a fractional tenth. For simple as well as special holes, Comtorplug's "automatic-accuracy" gaging has won a place in the production control set-ups of hundreds of fast-moving programs. *See why --request 8-page illustrated bulletin.*



COMTOR CO.
80 Farwell Street, Waltham 54, Massachusetts

REQUEST BULLETIN 50

Here's why Lufkin's indicator is the most sensitive!

Lufkin's V32 Dial Test Indicator is made with the precision of a fine watch, with jeweled bearings for longer life.

It has a 180° contact point swivel. The dial has clear, easy-to-read graduations to .0001" . . . and a switch lever for full reverse action.

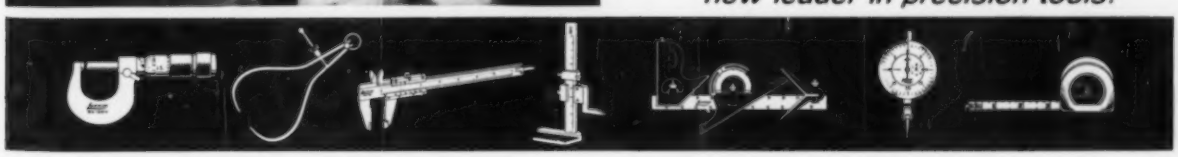
Exclusive ball-bearing mounting reduces friction, assures greater accuracy—an excellent example of how Lufkin leads in precision-tool design.

Mount the V32 on a Lufkin Miti-Mite Holder with its rigid (5/16") center post and you have a vertical testing setup that will stay firmly in place. (There's a permanent magnet in the base with a 50-lb. pull.)

See your industrial distributor. He knows precision tools and can show you how Lufkin leads in design and craftsmanship. His stock is maintained to fit your needs. See him for prompt and reliable service. LUFKIN, Saginaw, Michigan.

LUFKIN

new leader in precision tools!



SECTION CALENDAR (OCTOBER 1 TO NOVEMBER 10)

SECTION	DATE	PLACE	TIME	SUBJECT	SPEAKER
Albany	Oct. 10	Amsterdam, N. Y.	4:30 p.m.	Plant tour, Mohawk Carpet Mills Inc.	Charles D. Ferris, host
Akron-Canton	Oct. 19	Boiler Division, Babcock & Wilcox Co., Barberton, Ohio	7:00	Plant tour	Staff
Allentown-Bethlehem	Oct. 10	Walp's Restaurant, Allentown, Pa.	8:00	Joint meeting with AIEE	Dr. Ellis R. Ott, Rutgers • The State University, New Brunswick, N. J.
Reading Subsection	Oct. 3	To be announced	7:15	Foundry Quality Control	Sigmund Zobel, Carborundum Co., Electro-Minerals Division, Niagara Falls, N. Y.
	Oct. 26	Albright College	8:00 a.m.	QC Conference	Dorian Shainin, Rath & Strong Inc., Boston, Mass.
Buffalo	Oct. 30	To be announced	6:30	Annual Management Night	To be announced
Chicago	Oct. 11	Furniture Mart	4:30	QC and Cost Reduction—Two Sides of the Same Coin	Raymond Swenson, formerly of IIT
	Oct. 26-27	University of Chicago, downtown campus	9:00 a.m.	Two Day Training Course	Several
Cleveland	Oct. 6	Cleveland Engineering Society	8:00 p.m.	Famous Fudge Experiment	G. Wernimont, Eastman Kodak Co., Rochester, N. Y.
Columbus	Oct. 18	IBM Meeting Room	7:30	IBM Applications in QC	Panel
Corning-Elmira	Oct. 10	Lodge on the Green	8:00	Informed Customer Product Evaluation Means More Sales	Richard S. Bingham, Jr., Research and Development Division, Carborundum Co., Niagara Falls, N. Y.
Dallas-Fort Worth	Oct. 19	General Motors Corp., Arlington, Texas	7:30	QC in the Automotive Industry, plant tour	Troy Eubank, GMC
Dayton	Oct. 12	Delco-Moraine Division, GMC	8:00	Technical meeting	To be announced
Delaware	Oct. 5	To be announced	....	Ladies' Night	To be announced
Evansville-Owensboro	Oct. 9	Evansville College	6:30	The Story of Production	DoALL Company representative, traveling exhibit
Hartford	Oct. 10	Red Coach Grille, Wethers Field	6:30	Ladies' Night	To be announced
Hamilton-Middletown	Oct. 4	Hamilton, Ohio	6:30	Plant tour	.....
Indianapolis	Oct. 10	Butler University, Atherton Center	7:30	Management Problems—Decision Making	Dr. Harry Smith, Proctor & Gamble
Kansas City	Oct. 12	Elks Club, 19 E. Armour	6:00	To be announced	Robert I. Tenney, technical director and vice president, Fleischmann Malting Co., Chicago, Ill.
Lexington	Oct. 20	Lexington Signal Depot	7:00	To be announced	.....
Lima	Oct. 10	Clemans Bldg.	6:30	QC Personnel and Training Supervision	Edward A. Reynolds, QC Consultant, Ligonier, Pa.
Los Angeles	Oct. 5	IAS Bldg.	7:00	Bearing Inspection	Frank Saier, Industrial Tectronics
	Oct. 24	IAS Bldg.	7:00	Bearing Care and Design	Alex Rennie, Nortronics
Louisville	Oct. 9	To be announced	6:30	Army Panel Fundamentals of Probability	R. A. Dotey, Army Ordnance William A. Golomski, Jos. Schlitz Brewing Co., Milwaukee, Wis.
Merrimack Valley	Oct. 5	Lawrence, Mass.	6:00 p.m.	Reliability of Mechanical Parts	E. F. Dertinger
Metropolitan	Oct. 15	Robert Treat Hotel, Newark, N. J.	....	Vendor Certification	Earl Graumenz, Carrier Corp., Syracuse, N. Y.
Mid-Hudson	Oct. 8	Hotel DiPrima, Highland, N.Y.	7:00	To be announced	.....
Minnesota	Oct. 10	American Legion Post, 6501 Portland	7:30	Integrated QC in Research and Development	L. E. Snodgrass, Sandia Corp., Albuquerque, N. M.
Montreal	Oct. 28	Ecole Polytechnique, 2500 Marie Guyard St., Montreal	9:00 a.m.	Fifth Annual Forum—Quality Control Increases Productivity	Several
Greater Muskegon	Oct. 12	Brunswick Corp.	7:30 p.m.	Plant tour	A. S. Papp, host
Orange Empire	Oct. 3	Waterwheel Restaurant	7:15	Autonetics	John R. Shea, Autonetics Division, North American Aviation, Anaheim, Calif.
Sacramento	Oct. 18	Sacramento	6:00	Quality Mindedness—A State of the Mind	C. E. Bobbs, McClellan AFB, Calif.
Salt Lake City	Oct. 26	Doll House, Salt Lake City, Utah	6:30	To be announced	.....
San Francisco	Oct. 10	Old Plantation, Los Altos, Calif.	6:00	Reliability and the Polaris Missile System	B. L. Lubelsky, Polaris Reliability, Lockheed Missile & Space Division, Sunnyvale, Calif.
Santa Maria-Vandenberg	Oct. 24	Los Flores Inn, Santa Maria	7:00	To be announced	Glen E. Ghormley, Fellow, ASQC
South Bend-Mishawaka	Oct. 19	Packaging Corporation of America	8:00	Plant tour	.....
Toledo	Oct. 5	General Mills, Inc., Grocery Products Division, 1250 Laskey Road, Toledo	7:00	Plant tour	.....
	Nov. 2	EST Club Rooms, 4638 Lewis Ave., Toledo, Ohio	....	Machine Quality Capability Studies	Irwin DeGrote, Analysis & Standard Dept., Ford Motor Co., Dearborn, Mich.
Waco	Oct. 16	Elite Steak House	6:30	Back to the Basics in Precision Measurement	Harold C. Waite, district manager, Brown & Sharpe Manufacturing Co.
Washington, D. C.	Oct. 18	GSA Auditorium	8:00	Mathematical Aspects of Reliability	Dr. Wm. Wolman of NASA
Western Massachusetts	Oct. 10	Sheraton Motor Inn, Springfield, Mass.	6:30	Management of the QC and Inspection Function	A. B. Mundel, Sonotone Corp., Elmsford, N. Y.
Worcester	Oct. 19	Worcester Polytechnic Institute	7:00	Statistical Discovery and Evaluation	Paul S. Olmstead, Bell Telephone Laboratories, Whippany, N. J.
Youngstown	Oct. 5	Astoria Cafe, Warren, Ohio	6:30	To be announced	.....

1961 Catalog of American Standards

The 1961 Catalog of American Standards has been published by the American Standards Association.

This 72-page booklet includes the price list and index of over 1950 American Standards in such fields as civil engineering and construction, mechanical and electrical engineering, photography and motion pictures, materials handling and nuclear energy.

Standards recommendations which have been approved and published by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) are listed and indexed.

Over 1,000 national organizations (industry, engineering, science, professional and consumer groups, Federal government departments and agencies) are participating in the more than 425 projects which have been set up under ASA procedures at the national level.

Hundreds of American interests are likewise represented through ASA in standards projects organized under the ISO and IEC.

Founded in 1918 to serve as the focal point of voluntary national standardization in the United States, the ASA is a federation of 122 national trade, professional and consumer groups and counts 2200 companies as sustaining members.

American Society for Quality Control is one of the federation members and is proprietary sponsor of ASA project Z1, Application of Statistical Methods to Quality Control of Materials and Manufactured Products.

A free copy of the 1961 Catalog of American Standards may be obtained by writing to ASQC, 161 W. Wisconsin Ave., Milwaukee 3, Wis.

STATISTICIANS

IBM's newly formed Components Division has several openings for statisticians with strong interest and/or experience in the following fields . . .

Statistical design of experiments in solid-state device reliability studies

Analysis of experimental results

Devices performance prediction

Development of statistical evaluation procedures

Process evaluation and guidance

Assignments are in Poughkeepsie, New York, a pleasant non-metropolitan environment just 80 miles from New York City. Excellent schools and housing. Liberal benefits program including paid relocation expenses. All qualified applicants will be considered for employment without regard to race, creed, color or national origin.

Please write, outlining your qualifications and interests, to . . .

Mr. H. J. Cooke, Dept. 568K
IBM Development Laboratory
Box 390
Poughkeepsie, New York

IBM
International Business
Machines Corporation

"Electronics Div., ASQC presents:"

Product Maintainability Working Seminar

OCTOBER 24-25, 1961

Sheraton Hotel—Philadelphia, Pa.

TEN SESSIONS!

Tuesday, Oct. 24 9 a.m.—12 noon

Maintainability Specifications
ROBERT E. REDFERN, International Business Machines

Mathematical Models for Reliability, Maintainability, and Availability
DR. FRANK PROSCHAN, Boeing Airplane Co.

Considerations in the Design of Devices for Maintaining Equipment
L. G. GITZENDANNER, General Electric Co.

Tuesday, Oct. 24 1:45—4:45 p.m.

How and What to Tell the Design Engineer about Maintainability
JOEL COOPER, Northrup Corp.

Preventative Maintenance
DR. EVERETT L. WELKER, Arinc Research Corp.

Throw-Away Maintenance Policies
CHAUNCEY F. BELL, The Rand Corp.

Wednesday, Oct. 25 9 a.m.—12 noon

Human Factors Aspects in Maintainability
DR. NEHEMIAH JORDON, The Rand Corp.

Predicting Maintenance Time and Measuring Maintainability
RICHARD M. JACOBS, Sylvania Electric Products, Inc.

Organizing and Paying for Maintainability
DON DESANDRO, The Martin Co.

Wednesday, Oct. 25 1:45—4:45 p.m.

General Session

All sessions will be conducted in **seminar** fashion allowing and promoting extensive audience participation.

REGISTRATION FORM

Mail to: ALFRED S. WALL
63 Brookside Ave.
Allendale, N. J.

Please reserve ..... registrations at $30 each (including luncheon and materials) for:

Name .....

Company .....

Address .....

(Please use additional sheets to list additional names)

Make checks payable to:
ASQC Product Maintainability Working Seminar
Make your own hotel reservations. If made at the Sheraton, mention the Seminar.

ASQC Announces

ADVANCEMENT TO THE GRADE OF SENIOR

(as of June 30, 1961)

Van Gieson, Jerome G., Little Falls, N.J.
Williamson, E. Dean, Citrus Hgts., Cal.

(as of July 31, 1961)

Baburek, C. Stephen, Pointe Claire, Que., Canada
Black, Sutherland W., Cleveland, Ohio
Blakely, Alexander M., Philadelphia, Pa.
Brown, Richard N., Mexico, Mo.
Camara, Edward, Louisiana, Mo.
Carter, Austin B., Park Forest, Ill.
Clifton, K. C., Denver, Colo.
Coad, L. Keith, St. Paul, Minn.
Collard, Thomas H. Jr., San Antonio, Tex.
Connell, Lyle D., Palo Alto, Cal.
Dockery, Robert E., St. Louis, Mo.
Frey, Warren R., Florissant, Mo.
Hubbard, John V. Jr., Antrim, N.H.
Hubbard, Merton R., Burlingame, Cal.
Kulp, J. Wesley, Hanover, Pa.
Lang, Robert L. Jr., Hatboro, Pa.
Lewis, Richard L., Seattle, Wash.
Lonsdorf, C. Joseph, St. Ann, Mo.
Loutit, Isobel S., Montreal, Que., Can.
Lynch, Joseph P., St. Louis, Mo.
Martin, Kenneth Jr., Rocky Hill, Conn.
Meserve, Theodore W., Indianapolis, Ind.
Miller, Zavie, Montreal, Que., Canada
Peck, Richard H., Montreal, Que., Canada
Petersen, Kirk, St. Louis, Mo.
Prien, Walter F., Philadelphia, Pa.
Quirk, John H., Niagara Falls, N.Y.
Reis, Paul S., Citrus Heights, Cal.
Richer, Jacques, Montreal, Que., Canada
Rinella, Ralph E., Dyersburg, Tenn.
Russell, Thomas L., Los Gatos, Cal.
Saibel, Mahlon R., Haddonfield, N.J.
Scovronek, Jacob, Fairlawn, N.J.
Seldon, Mark R., Dallas, Texas
Singer, Melvin M., Park Forest, Ill.
Smith, Floyd R., Greenville, Ill.
Soderstrom, Carl G., Ballwin, Mo.
Thomas, Sidney B., Dorval, Que., Canada
Tomb, Charles K., North Highlands, Cal.
Wibbing, William F., Scottsdale, Ariz.

ADMISSIONS TO THE GRADE OF MEMBER

(as of June 30, 1961)

Abel, Roland N., Burlington, Iowa
Abrams, Leon T., Peoria, Ill.
Anderson, Elmer B., Peoria Hgts., Ill.
Andrews, William L., Dunlap, Ill.
Artim, Edward, Mineola, N.Y.
Atchison, W. Bruce Jr., Avon, Conn.
Barilla, Louis J., Jacksonville, Fla.
Barker, William R., Corning, N.Y.
Barringer, Robert J., Detroit, Mich.
Baumgartner, Robert J., Cicero, Ill.
Biesecker, Marion O., Peoria, Ill.
Bissel, Eugene F., Beverly, Mass.
Black, Robert W., Farmington, Ill.
Blake, Howard E. Jr., Salisbury, Md.
Blasdel, William G., Richmond, Va.
Bleier, Stephen J., Knoxville, Tenn.
Bobic, Robert J., Binghamton, N.Y.
Bosley, Chester R., Washington, Ill.
Bostic, Riggs Jr., Brimfield, Ill.
Bradow, Howard W., Clio, Mich.
Brandt, Foster A., Lakehurst, N.J.
Brooks, William D., South Plainfield, N.J.
Buckler, John H., Shrewsbury, Mass.
Bullington, Howard E., Pomona, Cal.
Cady, Frederick S., Chillicothe, Ill.
Carmody, John H., Peoria, Ill.
Chaney, Howard F., Anaheim, Cal.
Cheneler, Rocco, East Peoria, Ill.
Chermak, Rudolph J., Buena Park, Cal.
Chertkoff, Marvin J., Philadelphia, Pa.
Christman, Menzo A., Moorestown, N.J.
Clapper, Samuel W., Seneca Falls, N.Y.
Clark, Norman G., Phoenix, Ariz.
Clarke, Stanley P., Cornwall, Ont., Can.
Cochran, James E., Washington, Ill.
Cohen, Aaron, Philadelphia, Pa.
Cohen, Isidore L., Brooklyn, N.Y.
Collins, Wilkie E., La Puente, Cal.
Cooper, Herbert H., Shelton, Conn.
Crapo, Neal, Niles, Mich.
Crawford, Virgil L., Tustin, Cal.
Cuciti, Theodore, Oakland, Cal.
Daniel, Raymond E., Creve Coeur, Ill.
Desai, Mohan K., Rajkot, India
Desjardins, Alfred S., Milton, Ont., Canada
Desmond, Mac Chesney, Newington, Conn.
Deutsch, Richard, Berkeley Hgts., N.J.
Devine, Edward A., Philadelphia, Pa.
Edwards, John D., Whitesboro, N.Y.
Engel, Marvin, New York, N.Y.
Erickson, Hubert C., Peoria, Ill.
Ernst, Paul E., Florissant, Mo.
Ernst, Robert C., Detroit, Mich.
Eschenberg, Conrad J., Riverdale, N.Y.
Esken, Robert L., Dayton, Ohio
Euler, John M., South Bend, Ind.
Evans, Del E., Inglewood, Cal.
Fagiola, Ernest T., Locust Valley, L.I., N.Y.
Ferrick, James H., Richmond Hts., Mo.
Fetzer, Mervin J., Redwood City, Cal.
French, Jere B., Collinsville, Ill.
Fry, Jack D., Dunlap, Ill.
Gallant, Raymond A., Royal Oak, Mich.
Gallant, Robert L., Lynn, Mass.
Garoian, Geo., Newton Lower Falls, Mass.
Gerdes, Wilbur G., Peoria, Ill.
Gerelds, George W., Waltham, Mass.
Gibbs, Paul T., Peoria, Ill.
Goodman, Irwin F., Southfield, Mich.
Graham, Robert J., Toronto, Ont., Canada
Greenan, Ray H., Peoria, Ill.
Grimm, Andrew F., East Haven, Conn.
Hackner, Edward G., Pittsfield, Mass.
Hager, Wilbur F., Lawrence, Mass.
Hallstrom, Milton L., Stratford, Conn.
Hamlin, Leroy E., Peoria, Ill.
Harris, Maxene D., Decatur, Ga.
Harwick, Merle D., Canton, Ill.
Hausman, Harry C., Harper Woods, Mich.
Healy, Richard M., Peoria, Ill.
Henderson, Verle E., Mackinaw, Ill.
Hennigar, Harold W., Lansing, Mich.
Herrmann, John L., Lake Jackson, Texas
Hickey, Leo A. Jr., Mansfield, Mass.
Highfill, Harry J., Peoria Hgts., Ill.
Hock, Arthur L., Vancouver, B. C., Canada
Hodgkins, Winfield C. Jr., Millinocket, Me.
Honegger, Don L., Peoria, Ill.
Howarth, Donald G., Cleveland, Ohio
Hughes, Wilbur E., Peoria, Ill.
Hunt, Robert O., Needham, Mass.
Ihrke, Harold S., Birmingham, Mich.
Ingram, Harry F., Wilmette, Ill.
Irvin, Thomas D., Denver, Colo.
Jeknavorian, John, Lawrence, Mass.
Jenkins, Floyd E., Washburn, Ill.
Johnson, Raymond C., Grosse Ile, Mich.
Johnston, Harold S., Peoria, Ill.
Jones, William B., Normal, Ill.
Kennedy, Walter E., Peoria, Ill.
Kessler, David, Fullerton, Cal.
King, Donald B., Easley, S.C.
King, Fred J., Danbury, Conn.
Kiepel, Wilbur O., Racine, Wis.
Kreipke, William H. Jr., Carmichael, Cal.
Lally, Thomas J., Boston, Mass.
Lambird, Robert J., Baltimore, Md.
Lamoreaux, George W., Rochester, Mich.
Larsen, Arild S., London, Ont., Canada
Larson, Donna M., East St. Louis, Ill.
Lauer, Norbert F. Jr., Corning, N.Y.
Le Van, Harry L., Drexel Hill, Pa.
Lemon, William M., Pekin, Ill.
Lepkowski, L. W., Citrus Hts., Cal.
Levenson, Howard M., Norwalk, Conn.
Lonschein, Julian F., Hicksville, N.Y.
Luka, Walter R., Racine, Wis.
Lynette, Raymond G., Cleveland Hgts., O.
Magyari, John D. Jr., Madison Hgts, Mich.
Manning, Edward W., East Peoria, Ill.
Marsh, Clovis E., Adams, Mass.
Mayhew, William C., Lakewood, Ohio
McNallan, Owen T., Peoria Hgts., Ill.
McNaughton, Charles A. Jr., Monroeville, Pennsylvania.
McNutt, John F., Peoria, Ill.
Mead, Horace C. Jr., Morton, Ill.
Meadors, William A., Ashtabula, Ohio
Miller, Frank B., Fullerton, Cal.
Misley, Albert L., Belleville, N.J.
Miyauchi, Ichiro, Tokyo, Japan
Moore, Charles R., Detroit, Mich.
Moore, Joseph F., Peoria, Ill.
Morone, Joseph P. Jr., Indianapolis, Ind.
Muntz, Harry E. Jr., Peoria, Ill.
Niehls, Johnnie M., Ilion, N.Y.
Nydorf, Melvin L., Flushing, N.Y.
O'Donnell, Richard J., Marion, Va.
O'Reilly, Thomas P., St. Louis, Mo.
Ogle, Richard H., Pittsfield, Mass.
Orchant, Irving A., Seaford, L.I., N.Y.
Orenberg, Morris, Philadelphia, Pa.
Overdeer, Robert H., Jenkintown, Pa.
Parry, David H., Philadelphia, Pa.
Pascoe, Kenneth H., Lexington, Mass.
Passon, Philip J., Utica, Mich.
Pierce, Edgar F., Lynchburg, Va.
Piper, Albert B., East Peoria, Ill.
Pitt, Daniel P., Montreal, Que., Canada

Council Established in United Kingdom For Quality Control and Reliability

A National Council for Quality and Reliability has been established in the United Kingdom. The Council is an amalgam of more than 20 professional institutions, societies and other bodies concerned with the subjects of quality and reliability.

The following is the Council's statement of purpose: The National Council for Quality and Reliability has been formed by the agreement and co-operation of the several bodies concerned with the subjects of Quality and Reliability; it is not intended that the Council should absorb or replace the activities of any existing institution, society or other body, but that it should, by agreement, supplement or reinforce such activities in any appropriate sphere. Its objects shall be:

To promote appreciation of Quality and Reliability and foster the procedures for attaining these;

To co-ordinate the activities of corporate bodies working in the field of Quality and Reliability;

To act as a central source of information for Quality and Reliability;

To advise on training courses in Quality and Reliability procedures and to promote further developments in the field of education in these procedures;

To collect and administer funds for the purpose of carrying out the above subjects.

At its inaugural meeting July 4, the Council elected the following officers: chairman — F. Nixon, chief consultant (Quality) Rolls Royce Ltd.; vice chairman — I. R. Smith, chief inspector, Bristol Aircraft Ltd.; secretary — V. M. Green, British Productivity Council, and treasurer — J. Cross, British Productivity Council.

POLLOCK, THOMAS A., Pekin, Ill.
POLONUS, THEODORE A., West Peoria, Ill.
POYNOR, EMMETT D. JR., Amarillo, Texas
PRENTICE, LEONARD C., Fairfield, Conn.
PURCELL, JOHN M., Anaheim, Cal.
PYLE, PHILIP S., Media, Pa.
RASH, EDWARD H., Wilkes-Barre, Pa.
RAUBACHER, JOHN R., Livonia, Mich.
RELPH, KENNETH C., Cresaptown, Md.
RIPPER, VERNON W., Morton, Ill.
RIVENBURG, HARRY R., Orlando, Fla.
ROMANOFSKY, NICHOLAS K., Philadelphia, Pa.
ROUNIS, GUS T., Warren, Mich.
RUBIN, SAMUEL B., Philadelphia, Pa.
SANTOROSKI, FRANK A., Hazleton, Pa.
SASO, ROSARIO, F., Bethel, Conn.
SAWABINI, LUTFALLAH T., Arcadia, Cal.
SCHUBORT, ALTON J., San Antonio, Texas
SCOTT, JOHN H. JR., Trenton, N.J.
SEAGRAVES, GERALD B., Peoria, Ill.
SEELYE, ROBERT E., Livonia, Mich.
SELVEY, JOHN C., Chillicothe, Ill.
SMITH, CLAUDE E., Bartonville, Ill.
SMITH, DALE E., Redondo Beach, Cal.
SMITH, H. HERSCHEL, Peoria, Ill.
SMITH, ROY N., Peoria Hgts., Ill.
STANFORD, ROBERT F., Hatboro, Pa.
STANIUNAS, FRANK R., Marlboro, Mass.
STAPLETON, LOWELL L., Creve Coeur, Ill.
SUTTON, MYRA B., Morris Plains, N.J.
SVANOE, PER E., Glen Ellyn, Ill.
SWIES, JOHN J., Racine, Wis.
TALBOTT, VERNON G., Decatur, Ill.
TALL, MAX M., Levittown, Pa.
THOMAS, HOWARD A., Wood Dale, Ill.
TOWN, EDGAR JR., Natick, Mass.
TRIMARCO, JOSEPH A., East Peoria, Ill.
TROXEL, DAVID L. Pennsauken, N.J.
TULL, JACK T., East Peoria, Ill.
TUNIS, JOHN L., Flushing, N.Y.
VAN GIESON, JEROME G., Little Falls, N.J.
VAN HOOSE, THOMAS J., West Peoria, Ill.
VOSE, MATHIAS JR., St. Louis, Mo.
WALQUIST, LEIGH A., Garden Grove, Cal.
WALZ, WALTER E., Peoria, Ill.
WAMBAUGH, THOMAS M., Ridgeley, W. Va.
WARD, THOMAS G., La Vale, Md.
WARFIELD, JAMES M., East Peoria, Ill.
WASHBURN, LEE A., Columbus, Ohio
WEIGEL, CHARLES D., Peoria, Ill.
WELCH, CLARENCE A., Manito, Ill.
WESTCOTT, LLOYD M., Decatur, Ill.
WHENNEN, WALTER K., Peoria, Ill.
WILCOX, LANE S., Sacramento, Cal.
WILLIAMSON, E. DEAN, Citrus Hgts., Cal.
WILLIAMS, JACK E., Rutland, Vt.
WITMER, WILLIAM F., Oreland, Pa.
WORKMAN, GEORGE F., Peoria, Ill.
WOS, THEODORE, Linthicum, Md.
WRAY, ROBERT H., Sacramento, Cal.
YEAGLE, WILLIAM J., Pekin, Ill.
YENTES, ROBERT G., Peoria, Ill.
YOCISS, RONALD F., East St. Louis, Ill.
YOUNG, WILLIAM P., Washington, Ill.
ZUBER, LEWIS F., Pittsfield, Mass.

(as of July 31, 1961)

ACKLEY, ADOLPHUS W., Cincinnati, Ohio
ADAMS, ROBERT S., Kingsport, Tenn.
ALBURGER, JAMES R., Hollywood, Cal.
ALLEN, ALVIN D., Surgoinsville, Tenn.
AMMONS, ROBERT L., Kingsport, Tenn.
AVINA, JOSEPH R., Brighton, Colo.
BAESE, ROBERT O., Ovid, Mich.
BANCROFT, LAWRENCE C., Warren, Pa.
BARNHILL, JAMES E., Birmingham, Ala.
BAYLESS, ROBERT L. JR., Chicago, Ill.
BENSON, ALLAN B., Clark Lake, Mich.
BENTINCK, GEORGE F., Orangevale, Cal.
BLAKELEY, WILLIAM C., Los Angeles, Cal.
BLANKENSHIP, JACK G., Leighton, Ala.
BOYD, ARCHIE C., Pointe Claire, Que., Can.
BOYER, MARION D., Chillicothe, Ill.
BROWN, JAMES F., Augusta, Ga.
BUGNO, STEPHEN A., Kenmore, N.Y.
BURCHETT, CECIL F., Kingsport, Tenn.
BURGER, MARTIN, San Antonio, Texas
BURKE, RICHARD L., West Covina, Cal.
CARLSON, STANLEY P., Holden, Mass.
CHILDRESS, RICHARD H., Canoga Park, Cal.
CIANFROCCA, CARMINE J., Glendale, Cal.
CLARK, EUGENE W., Lake Park, Fla.
CLARK, ROBERT F., Reseda, Cal.
CLOW, RICHARD J. JR., Cocoa Beach, Fla.
COBLE, JOHN E., West Asheville, N.C.
COLLINS, ELMER F., Falls Church, Va.
COOK, EUGENE M., Los Angeles, Cal.
COOLEY, DONALD A., Los Angeles, Cal.
COONEY, JOHN P., Santa Monica, Cal.
CRAIG, FORREST E., McGregor, Texas
DALY, THOMAS P., Redwood City, Cal.
DE LUCA, JOSEPH W., Herkimer, N.Y.
DE SALVO, ALEXANDER F., New York, N.Y.
DEMPSEY, WILLIAM J., Burbank, Cal.
DENT, WESLEY A., East St. Louis, Ill.
DICK, JAMES K., Ashtabula, Ohio
DOEHR, VERDAIN S., Utica, Mich.
EAGAN, JAMES R., Marietta, Ohio
ELDER, LEON E. JR., Los Angeles, Cal.
ELSEA, PAUL, Belleville, Ill.
EMIG, JOHN W., Glen Rock, Pa.
FIELD, ROBERT R., Singking Spring, Pa.
FITZGERALD, FRANK R., Lancaster, Cal.
FOX, NATHAN G., Duluth, Minn.
FREDERISY, ROBERT H., Anaheim, Cal.
FRENCH, WILLIAM L., East Northport, N.Y.
FRIEND, RICHARD A., Binghamton, N.Y.
FRITZ, ROBERT J., Clifton, N.J.
FULLER, ROBERT G., Tuscaloosa, Ala.
FULLER, WILLIAM E., Inglewood, Cal.
GALLO, PAUL G., Massapequa, L.I., N.Y.
GALLUP, EDWARD R., Belleville, Ill.
GARDNER, FLOYD N., Flint, Mich.
GASTON, JOHN H., North Plainfield, N.J.
GIORDANO, JOHN L., Des Plaines, Ill.
GOLDBAUGH, JESSE L., Massillon, Ohio
GRAHAM, ALAN H., Watervliet, N.Y.
GREEN, GEORGE E., Springfield, Ohio
GREENE, CECIL E., Canton, Ohio
GREENWOOD, HARRY D. JR., Sacramento, Cal.
GREINER, WILLIAM R., Peoria, Ill.
GRIFFIN, CHARLES J., Los Angeles, Cal.
GRIFFIN, RONALD J., Cheektowaga, N.Y.
GRISHAM, CHARLES T., Dayton, Ohio
GUY, ARTHUR E., Redondo Beach, Cal.
HACKNER, IRWIN H., Minneapolis, Minn.
HANCOCK, EARL A., Madison, Ill.
HANNA, JAMES W., Hadden Heights, N.J.
HATHY, ALBERT S., Ashtabula, Ohio
HEATH, ROBERT E., Niles, Ill.
HIGGINBOTTOM, E. L., Burnsville, Miss.
HIRT, HAROLD K., North Olmsted, Ohio
HISTON, THOMAS D., Utica, N.Y.
HODGE, MILLARD W., Winston-Salem, N.C.
HODGES, CHARLES E., S. Charleston, W. Va.
HOLLINGER, PHILIP, Pacoima, Cal.
HOSKINS, BERNIE L. JR., Ashtabula, Ohio
HURTADO, HENRY J., New York, N.Y.
HUTCHINS, GUY V., Anaheim, Cal.
JACKSON, CALVIN R., Pomona, Cal.
JAGEL, TED F., Anaheim, Cal.
JELMELAND, MARK C., Burbank, Cal.
JENSEN, LEE T., La Puente, Cal.
JOHNSON, CAVE T., Van Nuys, Cal.
JOHNSON, ROBERT W., Falls Church, Va.
JOHNSON, RUSSELL V., West Hartford, Conn.
JONES, RUDOLPH, Philadelphia, Pa.
KAMIN, THADDEUS, Buffalo, N.Y.
KELLY, WILLIAM E., Richmond, Va.
KEMP, EDWARD C. JR., Fair Oaks, Cal.
KERNKAMP, MELVIN W., Santa Ana, Cal.
KINTZ, RICHARD T., North Canton, Ohio
KISTNER, WILLIAM G., Cheektowaga, N.Y.
KLIMAS, VINCENT A., Terryvill, Conn.
KNOX, DAVID N., La Canada, Cal.
KYTE, PATRICK N., Pointe Claire, Que., Can.
LAMKIN, LESSEL E., Albuquerque, N.M.
LANGENBACH, JAMES M., Elk Grove Village, Illinois
LANKARD, GERALD M., Williamsport, Pa.

1961
11th
ANNUAL

AIRCRAFT & MISSILE DIVISION

National Conference

AIRCRAFT AND MISSILE DIVISION
of the AMERICAN SOCIETY
FOR QUALITY CONTROL

Host . . .
LOS ANGELES SECTION
to be held at the
AMBASSADOR HOTEL
LOS ANGELES, CALIFORNIA

NOVEMBER 9-10, 1961

CONFERENCE THEME *"Assuring Customer Satisfaction"*

General Bernard A. Schriever, Air Force Systems Command, and other outstanding persons in their fields will speak in FOUR CONCURRENT SERIES OF SESSIONS.

I	II	III	IV
INTERNATIONAL AND GENERAL INTEREST	DESIGN RELIABILITY	PRODUCTION QUALITY CONTROL	FIELD SERVICE MAINTAINABILITY

For a complete program write:
HARRY HARRIS, *Publicity Chairman*
c/o NORTH AMERICAN AVIATION, INC.
INTERNATIONAL AIRPORT
LOS ANGELES 9, CALIFORNIA

YOU NEED RUBBER HARDNESS CONTROL
Essential for INSPECTORS ENGINEERS USERS OF RUBBER PARTS
"Vest Pocket" Model 1500
With Easy-to-Read Vernier

Rex

Rubber Hardness Gauges

The *EXACT* Hardness of Rubber and other Elastomers can easily be measured and verified in Durometer "A" Units. ASTM and MIL spec. approved. Lifetime accuracy.

Write "Dept. R" for prices and data sheet on Rubber Hardness Testing.

Rex
GAUGE COMPANY, INC.
P.O. BOX 46, GLENVIEW, ILL.
PHONE: PArk 4-6668

Lash, Carroll C., Sunland, Cal.
Lentz, Daniel C., Evansville, Ind.
Lewis, Richard L., Seattle, Wash.
Liddle, Ivan S., Orrville, Ohio
Livesay, William E., Canton, Ohio
Lundeen, F. Jerry, Rock Island, Ill.
Lupo, Nicholas A., Canoga Park, Cal.
Lytz, Hubert B. Jr., Akron, Ohio
Manning, Herbert, Sacramento, Cal.
Marshall, Donald M., Northport, L.I., N.Y.
Martin, Arthur J., Portland, Mich.
McArthur, Bill, Torrance, Cal.
McCarthy, John J., New Haven, Conn.
McCurry, Hartsell F., Jonesboro, Tenn.
McGrew, David R. Jr., Anaheim, Cal.
McPherson, Ralph T., Kingsport, Tenn.
Medici, Anthony M., Wayne, N.J.
Menning, W. Eugene, Toledo, Ohio
Merbler, H. J., Arlington, Texas
Merrill, John B., West Hartford, Conn.
Milham, F. K., Garden Grove, Cal.
Moleski, Joseph C., Stratford, Conn.
Molley, John R., Forest Lake, Minn.
Montgomery, Donald H., Dayton, Ohio
Moore, Charles P., Los Angeles, Cal.
Morgan, Robert S., Avon Lake, Ohio
Mudd, Joseph R., Ashtabula, Ohio
Naftulin, Albert D., Hicksville, N.Y.
Nations, Ronald, Kingsport, Tenn.
Nissen, Harold L., Lakewood, Cal.
Nix, Robert R., Richardson, Texas
Noebner, Fredric C., Ashtabula, Ohio
Norlin, Magnus G., Mundelien, Ill.
O'Brien, Joseph A., Detroit, Mich.
Olsen, Lawrence M., Tarzana, Cal.
Pace, Roger W., Santa Maria, Cal.
Parsons, Robert L., Rosemead, Cal.
Pauley, Joseph A., Florissant, Mo.
Perrin, Elliot C., East Hartford, Conn.
Perrine, Robert F., Ashtabula, Ohio
Peter, Russell A., Tonawanda, N.Y.
Plemel, James E., Van Nuys, Cal.
Pohle, Louis E., Canoga Park, Cal.
Poole, Charles J., Florham Park, N.J.
Potter, George I., Canton, Ohio
Pranger, Donald L., Bountiful, Utah
Price, Daniel, Whitestone, N.Y.
Proctor, Fred W., Worcester, Mass.
Proctor, Phimister B., Los Angeles, Cal.
Rineer, Joseph H., Torrance, Cal.
Rinehimer, William A., San Antonio, Tex.
Rinella, Ralph E., Dyersburg, Tenn.
Ritter, Durward D., Sacramento, Cal.
Rivers, Russell W., Battle Creek, Mich.
Roberts, Richard J., Rochester, N.Y.
Rosenberg, Bernard, Philadelphia, Pa.
Rutherford, Ralph J., Newport Beach, Cal.
Sanders, Ward I., Carmichael, Cal.
Sandie, Robert A., West Los Angeles, Cal.
Santos, William E., Brooklyn, N.Y.
Sawicz, C. Frank, Los Angeles, Cal.
Schniepp, Ronald M., Drexel Hill, Pa.
Schnipper, Joseph, Oceanside, N.Y.
Schumacher, Charles M., Visalia, Cal.
Sears, Duane C., Ashtabula, Ohio
Shaffer, Arba A., Creve Coeur, Ill.
Shinafelt, Thomas W., Dallas, Texas
Smith, Charles A., Bethlehem, Pa.
Smith, Charles E. Jr., Albuquerque, N.M.
Solberg, Myron, Malden, Mass.
Spahn, Raymond E., Detroit, Mich.
Spalding, John H., Peoria, Ill.
Spencer, John R., St. Ann, Mo.
Spencer, T. H., Peoria, Ill.
Stanley, Martin M., Burbank, Cal.
Steffler, William R., Flushing, Mich.
Stehben, Harold M., Peoria, Ill.
Stone, Charles W., Pomona, Cal.
Storchheim, Samuel, Forest Hills, N.Y.
Stretcher, John H., Overland Park, Kans.
Sullivan, Ulysses S., Pekin, Ill.
Tallon, Robert J., Arlington, Texas
Tarr, Charles T., Allentown, Pa.
Thompson, Jasper L., North Wales, Pa.
Thomson, Jesse C., Utica, N.Y.
Tombrink, Bernard E., Dallas, Texas
Toon, Leslie A., Lancaster, Pa.
Tract, Sam, Dorchester, Mass.
Turner, Ray M., Chatsworth, Cal.
Turner, Robert E., Sacramento, Cal.
Van Etten, William O., Peoria, Ill.
Van Hoose, Jeff M., Glendale, Cal.
Vanatta, William S., Akron, Ohio
Veiss, Otomars, Battle Creek, Mich.
Viehmann, Norman J., Andover, Mass.
Wagner, Bernard, Sepulveda, Cal.
Warren, Harry R., Laurel, Miss.
Wasser, Ellsworth J., Caseyville, Ill.
Waterhouse, William E., Northridge, Cal.
Weber, J. Coleman, St. Louis, Mo.
Weiss, Howard M., Bethesda, Md.
Welser, Marcus A., Newark Valley, N.Y.
White, Jack E., Torrance, Cal.
Williams, George B., Largo, Fla.
Wyatt, Charles L., Acton, Mass.
Yoshimura, Hiroshi, Ota-ku, Tokyo, Japan
Zee, Stephen, J., Avon, Conn.
Zeglen, Adolph G., Maquon, Ill.
Zuniga, Jesus L., San Antonio, Texas

ADVANCEMENT TO THE GRADE OF MEMBER
(as of July 31, 1961)

Budd, Robert O., Richland, Wash.
Christensen, Howard B., Forest Hills, N.Y.
Gottschalk, Ben C., Richmond, Ind.
Grossman, M. J., Seattle, Wash.
Jones, Paul C., Albuquerque, N.M.
Kirk, Joseph G., Jupiter, Fla.
Poburka, Philip D., Grand Prairie, Tex.
Price, Howard J., Cumberland, Md.
Ratcliff, Billy G., Sherman Oaks, Cal.
Ritter, Albert J., Niagara Falls, N.Y.
Williams, Burke, Bay City, Mich.

ADMISSIONS TO THE GRADE OF ASSOCIATE MEMBER
(as of June 30, 1961)

Andrews, Charles T., E. Cleveland, Ohio
Balas, Fred F., Blackwood, N.J.
Bartlett, Harold H., Peoria, Ill.
Bastian, Robert J., Hamilton, Ohio
Belliotti, John V., Niagara Falls, N.Y.
Boe, Howard E., Broadview, Ill.
Bonniger, Kenneth L., Wesleyville, Pa.
Boyce, James J., Bayside, N.Y.
Brennan, Robert W., Clawson, Mich.
Camp, James H. Jr., Atlanta, Ga.
Elm, Gerald L., South Norwalk, Conn.
Eucher, Charles W., Ames, Iowa
Fetters, Jerry L., East Sparta, Ohio
Finnan, James B., Levittown, N.Y.
Foster, Charles P. Jr., San Jose, Cal.
Holman, Clarence J., Plymouth, Mich.
Kingery, Richard W., Winnetka, Ill.
Krawczyk, Edward J., Detroit, Mich.
La Rouche, Gerald J., Detroit, Mich.
Lauder, Lilliam A., Hartford, Conn.
Lee, Gorham M., North Andover, Mass.
Leonard, Richard, Oakland, N.J.
Matteson, Donald L., Ashtabula, Ohio
McNeill, John W., St. Louis, Mo.
Morris, David F., Basingstoke Hamp., Eng.
Moul, Douglas W., Richmond, B.C., Can.
Necci, John L., Philadelphia, Pa.
Norcross, Edward C., Haddonfield, N.J.
Norris, Andrew S., Detroit, Mich.
Ollerman, Max J., Oakland, Cal.
Perry, Robert J., Albany, N.Y.
Reinoldi, Charles M., Joliet, Ill.
Rolleston, George A., Flint, Mich.
Rosenberg, George H., Peoria, Ill.
Scott, Thomas M. Jr., Redlands, Cal.
Shideler, James H., Palo Alto, Cal.
Spicer, Stephen G. Jr., Willow Grove, Pa.
Srock, Joseph Jr., Morton Grove, Ill.
St. Francis, Robert, Alexandria, Va.
Stokely, Robert G., West Covina, Cal.
Thevne, Donald H., Passaic, N.J.
Trebil, Kennard C., Orange, Cal.
Trowbridge, James R., Westfield, N.J.
Vredingbrugh, Charles H., Elkart, Ind.
Warzocha, Adam A., Meadville, Pa.
Wickham, Thomas C., Pittsburgh, Pa.
Wise, Howard E., West Chicago, Ill.

ADMISSIONS TO THE GRADE OF ASSOCIATE MEMBER
(as of July 31, 1961)

Andrews, Robert K., Gulf Breeze, Fla.
Balcom, Edward J., South Euclid, Ohio
Benner, Floyd E. Jr., Wadsworth, Ohio
Benzel, Robert W., Aachen, West Germany
Bills, Robert H., Ashtabula, Ohio
Bomberger, William H., Lancaster, Pa.
Bruno, Theodore V., Bellaire, Texas
Burnett, William H., Berkeley Hgts., N.J.
Caldwell, John W., Reseda, Cal.
Christopher, Marlowe N., Ashtabula, Ohio
Clifford, James C., Inglewood, Cal.
Coles, Thomas A., Houston, Texas
Collin, Willard L., Granada Hills, Cal.
Cooper, John H., Saegertown, Pa.
Davis, Leonard D., La Puente, Cal.
Dawson, Harold S., Lincoln, R.I.
Dewart, Robert H., S. Glens Falls, N.Y.
Dilday, Dennis H., Oklahoma City, Okla.
Dill, William J., Tallahassee, Fla.
Du Deck, Michael D., Granada Hills, Cal.
Dunbar, Harry L., Austinburg, Ohio
Dwinell, Berton W., Willow Grove, Pa.
Foley, Jack W., Geelong, Vic., Australia
Gauger, Robert H., Glen Head, L.I., N.Y.
Gean, James A., Keller, Texas
Gentry, Owen L., Dayton, Ohio
Gould, Robert C., Meriden, Conn.
Harrick, Richard D., Kent, Ohio
Hill, Franklin A., Chicago, Ill.
Honsberger, Clarence W., Long Beach, Cal.
Hosie, Don A., Peebles, Ohio
Huff, William M., Johnson City, N.Y.
Hughes, Donald E., Glendale, Cal.
Johnson, Alan R., East Islip, N.Y.
Jones, Jack D., Canoga Park, Cal.
Juenger, Robert, Easton, Pa.
Kathner, Roy E., Venice, Cal.
Kelm, LeRoy F., Playa del Rey, Cal.
Kirkpatrick, Howard B., Houston, Texas
Lacroix, George V. Jr., Peterborough, N.H.
Lane, Bruce C., Vestal, N.Y.
Lewis, Evan T., Conneaut, Ohio
Lukkarila, Carl E., Ashtabula, Ohio
McCord, Lance W., Douglassville, Pa.
McKelvey, Edward S., Edwardsville, Ill.
Mitsted, Clifford M., Palmyra, N.J.
Mitchinson, Donald F., Newark, N.Y.
Olsen, Arthur A., Los Angeles, Cal.
Owens, Paul W., Akron, Ohio
Penny, Ernest A., Caldwell, N.J.
Piernot, Robert M., Andover, Ohio
Powell, Michael E., Waco, Texas
Rains, Betty M., Okemah, Okla.
Richard, Robert P. Sr., Waynesboro, Va.
Richardson, R. L., Cuyahoga Falls, Ohio
Roden, Eugene A., Harrisburg, Pa.
Schultz, Richard C., Kalamazoo, Mich.
Sheldon, James L., San Jose, Cal.
Slusser, Charles L., Hartville, Ohio
Taraschi, Frederic T., Haddon Hts., N.J.
Timblin, Stanley W., Baltimore, Md.
Tweedie, William P., Jersey City, N.J.
Vance, Charles V., Waukegan, Ill.
Weddle, Leon E., Pasadena, Texas
Wells, Robert L., Walworth, Wis.
Woods, Martin C., Woodbury, N.J.
Zabriskie, Robert G., West Orange, N.J.

ADVANCEMENT TO THE GRADE OF ASSOCIATE MEMBER
(as of July 31, 1961)

Marash, Stanley A., Storrs, Conn.

STUDENT ENROLLMENTS
(as of July 31, 1961)

Katz, Jerry A., Minneapolis, Minn.

ASQC Personnel Listing Service

WANTED!

1 **QC Department Head,** *Electro-Mechanical*
1 **QC Engineer,** *Electro-Mechanical*
1 **Quality Assurance Engineer,** *Semiconductor Industry*
1 **QC Manager,** *High Precision Ferrous Metal Components*
1 **QC Manager,** *Bearings*

REGISTER NOW!

A personnel listing service exists for the use of ASQC members only. Any member desiring to be listed as available for new employment opportunities should send a brief resume (on 3 × 5 file card, or cards) to ASQC Personnel Listing Service, Room 6185 Plankinton Building, 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin.

All information will be kept confidential and those listed will be sent descriptions of all suitable opportunities for 60 days following receipt of this initial listing. If it is your desire to remain on the list after this period, you can do so by writing to the same address and requesting an additional 60 day period. If you do *not* request an extension, you resume will be removed from the file on the assumption that you have made a successful connection.

Companies wishing to post positions available in the ASQC Personnel Listing Service should address all correspondence to the same address as above giving the educational and experience requirements, age and salary limits on each position. The position description should be limited to 100 words plus the complete name and address of the individual to whom resumes should be sent.

clinics, conferences, and courses

SEPTEMBER

. . . 26—One Day Quality Assurance educational program, at the Sheraton Motor Inn, Springfield, Mass., sponsored by the Western Massachusetts section, ASQC. The program is designed as a service to companies involved in government contract work who either need orientation in quality assurance requirements or have had persistent problems in fulfilling these requirements to government satisfaction. This program should be of interest not only to people concerned with government contracts, but also to those interested in introducing quality assurance into their own companies. The program will consist of five one-hour sessions beginning at 2 p.m.; dinner at 5:30 p.m., with sessions resuming at 7 p.m. and concluding at 9 p.m. Contact Alan Donnelly, Bigelow-Sanford Carpet Co., Thompsonville, Conn.

. . . 28—Basic QC course Sept. 28-Dec. 7, Intermediate QC course Sept. 30-Nov. 18, sponsored by the St. Charles section, ASQC, St. Charles, Ill. D. Voss will conduct the Basic course Thursdays from 7 to 9 p.m. Intermediate course instructors E. Egli and R. Maass will teach Saturdays from 8 a.m. to 12 noon. Contact Martin F. Patton, 508 46th Avenue, Bellwood, Ill.

. . . 30—Reliability Training Course sponsored by the Electronics Division, ASQC, and local members of the IRE. It will begin Sept. 30 and consist of 12 three hour sessions on Saturday mornings. The Chicago section, ASQC, although not directly a co-sponsor, is cooperating and assisting wherever possible. Contact Martin Joseph, KE 3-6700, ext. 501.

. . . 30—Western Michigan Quality Control Clinic for Business and Industry sponsored by the Greater Muskegon section, ASQC, at the Occidental Hotel. Contact Merrill S. Bailey, Anaconda Wire and Cable Co., Muskegon, Mich.

OCTOBER

. . . 2—Community College Courses in Industrial Quality Control, an adult education, noncredit program offered by State College, Indiana, Pa. An eight week course in statistical quality control will start Oct. 2. A seven week course in management of quality control will start Oct. 6. The courses will meet one night a week from 6:45 to 9 p.m. Instructor—Edward A. Reynolds, Quality Control Consultant, Ligonier, Pa. Contact Dr. I. L. Stright, State College, Indiana, Pa. Plan definite enrollment not later than Sept. 11.

. . . 2—Industrial Quality Engineering course sponsored by the Sacramento section, ASQC, will cover the development of the principles of quality engineering from the construction of the Egyptian Pyramids to the present day. It will emphasize the increasing importance of the quality engineer in the variety of enterprises. Contact M. K. Walker, Aerojet-General Corp., P.O. Box 1947, Sacramento 9, Calif.

. . . 4-6—Semi-Annual Convention, American Society of Photogrammetry, Biltmore Hotel, New York City. Contact Timothy Trott, Aeroflex Corp., 34-06 Skillman Ave., Long Island City, N. Y.

. . . 6-7—Intensive Short Course in Reliability sponsored by the Lima section, ASQC. Harmon S. Bayer, Quality Control Consultant, Detroit, Mich., will be the instructor. Contact D. C. Fultz, Lima Engine Plant, Ford Motor Co., Lima, Ohio.

. . . 9-11—Eighth Annual Three Day Conference "Quality Control for Management" will be presented by the Boston section, ASQC, in cooperation with Northeastern University at the Center for Continuing Education in Weston, Mass. Staff members will include Leonard Seder, Quality Control Consultant and associate editor of Quality Control Handbook; Dorian Shainin, vice president and director of statis-

Sturtevant

TORQUE TESTING FIXTURES

FOR LABORATORY

As a design check to accurately determine the ultimate strength of screws, parts and assemblies, or to apply proof loads.

TCF 100-1 Torque Checking Fixture

FOR INSPECTION

To test purchased or produced material and parts where torsion and holding strength are important factors.

POF 400 Push-Off Fixture

FOR PRODUCTION

To prevent breakage or spoilage by accurately controlling alignment as torque or force is applied in the assembly of parts.

TTF¼ Torque Testing Fixture

The Sturtevant engineering staff will collaborate with users in the design of special application testing fixtures.

Write for Catalog

PA STURTEVANT CO ADDISON QUALITY ILLINOIS

ACCURACY + PORTABILITY + ECONOMY

precision measurements

Take it anywhere

Cuts costs

THE KING PORTABLE BRINELL HARDNESS TESTER

DELIVERS ALL THREE FOR UNLIMITED USES!

Precise quality control — the most important function of any hardness test, is one of the many reasons users depend on the King Portable! Together with the King Brinell Scope, the King Portable provides quick readings on almost any size or shape of metal in practically any location!

Economical too, because one test head can be used in many inexpensive adapters.

Get complete information now by writing for literature, prices and a demonstration.

KING TESTER CORP.
448 N. 13th Street
Philadelphia 23, Pa.

Known the world over for accuracy and dependability • Representatives in principal cities

Certain areas open for representatives

tical engineering, Rath & Strong, Inc.; Warren R. Purcell, QC director, Raytheon Co., and vice president, ASQC; Bernard Goldsmith, associate professor of management and director of the Center for Management Development, Northeastern University; William S. Hertzmark, chief industrial engineer, Power Tube Division, Raytheon Co. This conference will place considerable emphasis on discussion of questions of common interest to the registrants, and will provide management with information to organize and guide a successful QC program. Contact Daniel Phipps, registrar, Keystone Manufacturing Co., Hallet Square, Boston 24, Mass. GEneva 6-8000, Ext. 78.

. . . **9-11**—National Electronics Conference, International Amphitheatre, Chicago, Ill. Sponsors include the American Institute of Electrical Engineers, Illinois Institute of Technology, Institute of Radio Engineers, Northwestern University, and the University of Illinois. Participants are Electronic Industries Association, the Society of Motion Picture and Television Engineers, Iowa State University, Marquette University, Michigan State University, Purdue University, University of Michigan, University of Notre Dame, University of Wisconsin, and Wayne State University. Contact NEC, 228 N. LaSalle St., Chicago 1, Ill.

. . . **10-12**—12th National Conference on Standards, Rice Hotel, Houston, Texas. Contact American Standards Association, 10 E. 40th St., New York 16, N. Y.

. . . **12-14—Three day short course on the Evaluation and Interpretation of Physical and Chemical Testing Methods at the Red Lobster Restaurant-Kenton Manor Motel, Tonawanda, New York. It will be sponsored by the Chemical Division, ASQC, and the Buffalo section, ASQC. Course instructors will be John Mandel, a member of the Testing and Specifications section at the National Bureau of Standards, and Grant Wernimont, Eastman Kodak Co., a pioneer in the study of accuracy and precision of testing methods. The course will be of value to laboratory personnel of all industries who have little or no experience in the statistical treatment of test data and evaluation of test methods. No experience in statistics is required. Contact James E. Dillman, chairman, Chemical Division Lab Course, Hooker Chemical Corp., P. O. Box 344, Niagara Falls, N. Y.**

. . . **15-19**—17th International Instrument-Automation Conference, Coliseum, New York City. Contact Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa.

. . . **16-17**—National Symposium on Engineering, Writing and Speech with the theme—Communicating Ideas—The Modern Engineer's Function. The symposium, which will be co-sponsored by the Institute of Radio Engineers' Professional Group on Engineering, Writing and Speech (PGEWS) and the College of Eingineering, Michigan State University, at the Kellogg Center for Continuing Education, Michigan State University, East Lansing, Mich. Keynoter for the Symposium will be Professor Dwight Gray. Frank Leamer, personnel director, Bell Telephone Laboratories, will be the dinner speaker while the luncheon meetings will hear Dean J. D. Ryder of Michigan State and W. L. Dunn, vice president, Admiral Corp. Invited speakers include Miss Eleanor M. McElwee, RCA; David M. Davis, Wright-Patterson AFB; B. F. Cheydleur, Philco; Dr. Richard Gerfen, Northwestern University, and Professor H. E. Koenig, University of Michigan. Contact IRE-PGEWS, c/o Continuing Education Service, Michigan State University, East Lansing, Mich.

. . . **17—Annual Joint Conference sponsored by the Utica and Syracuse sections, ASQC, at Twin Ponds Golf and Country Club, Utica—New York Mills—N.Y. Contact Raymond G. Morton, Glass Factory Road, Marcy, N.Y.**

. . . **19**—Symposium on Statistical Principles and Practical Applications, 2-4:30 p.m., Sheraton-Atlantic Hotel, 34th St. and Broadway, New York City, sponsored by Committee D-13 on Textile Materials, American Society for Testing Materials. Contact Herbert A. Ehrman, secretary, Committee D-13, ASTM, 9720 Bexhill Drive, Kensington, Md.

. . . **19-20—16th Midwest Quality Control Conference, Chase-Park Plaza Hotel, St. Louis, Mo. The theme—The Universality of Statistics—will be carried out by talks on statistics and baseball, statistics and sex, statistics and stock market, statistics and gambling, statistics and crime, statistics and medicine, statistics and warfare, and statistics and weather. The conference will also include papers on basic and advanced QC techniques and will feature basic, advanced, and section management training courses. Contact H. H. Bock, registration chairman, Olin-Mathieson Chemical Corp., East Alton, Ill.**

. . . **20**—Second New York Conference on Electronic Reliability scheduled by the Metropolitan Chapter of the IRE Professional Group on Reliability and Quality Control at New York University, College of Engineering, University Heights, will be under the joint sponsorship of the New York, Long Island, and Northern New Jersey sections of the IRE. Theme—"System Reliability Engineering." Advance registrations, with a check in the amount of five dollars payable to the New York Conference on Electronic Reliability, may be sent to

American Society of Safety Engineers To Observe 50th Anniversary Oct. 8

The American Society of Safety Engineers will observe its 50th anniversary Oct. 8, 1961. It is the oldest national safety organization in the United States.

Founded as the United Association of Casualty Inspectors in 1911 by a number of insurance company inspectors in New York City, the Society changed its name to the American Society of Safety Engineers in 1914. The following year it was chartered by the State of New York.

As the scope of the Society's activities expanded, its members decided they could best serve their purpose by working with the National Safety Council (founded in 1912) and in 1924 the Society merged with the National Safety Council. It then became known as the Engineering Section of the Council.

The Society remained a part of the Council until 1947 when its membership again voted to reestablish itself as an independent organization but to maintain affiliation with the Council. The Society remained housed in the offices of the Council until 1959 when it opened its own headquarters at 5 N. Wabash Ave., Chicago.

At present the Society is composed of some 7,000 members in the United States, Canada and many countries throughout the free world. A total of 76 Chapters are located in almost every state of the nation.

The purpose of the Society, as stated in its constitution, is to "expand the use and effectiveness of the application of the arts and sciences to the prevention of accidents and the conservation of health, life and property by the control of environmental exposures and human behavior."

Members of the Society serve as safety directors and administrators in industry, government and insurance companies. Principal activities of the Society include research and development of safety data, establishment of safety codes for government and industry, development of college courses in industrial safety, sponsorship of courses, institutes and training seminars, assistance to government and other organizations in setting up safety conferences, and the exchange of information through various publications for the benefit of its membership and others working in the field of accident prevention.

Local Chapters cooperate with other organizations in their communities to establish safety codes and practices, promote safety in schools, assist state and municipal authorities in establishing safety laws and ordinances, sponsor and provide guidance to local Junior Achievement groups, work with Civil Defense authorities, and promote fire prevention activities.

Officers include president—George L. Gorbell, manager of safety and fire protection, Monsanto Chemical Co; first vice president—John V. Grimaldi, consultant for safety and plant protection, General Electric Co.; second vice president—Michael F. Biancardi, manager of safety services, Allis-Chalmers Manufacturing Co.; treasurer—Frank E. Laderer, director of safety, Nationwide Insurance Co., and secretary—A. C. Blackman, Society Managing Director.

M. A. Benanti, Molecular Electronics Co., New Rochelle, N. Y.

. . . **22-25**—Fall Meeting of the National Fluid Power Association, Sheraton Hotel, Philadelphia, Pa. Contact National Fluid Power Association, 5595 N. Hollywood Ave., Milwaukee, Wis.

. . . **23—Six week, 12 hour short course on basic concepts of quality control sponsored by the Waco section, ASQC. The course will be directed toward industries interested in starting QC departments. Contact Donald H. Barrett, 2501 Charboneau, Waco, Texas.**

. . . **23-27**—43rd National Metal Congress, Cobo Hall, Detroit, presented by American Society for Metals and eight participating organizations. Contact T. C. DuMond, ASM, Metals Park (Novelty), Ohio.

. . . **23-28—Reliability Training Conference, Sheraton Mt. Royal Hotel, Montreal, Quebec, Canada, sponsored by the ASQC Electronics Division, and the PGRQC of IRE. Leonard Thomas is chairman of the Canadian Host Committee. Fee—$225 includes tuition, course materials, luncheons and a dinner. Contact Naomi McAfee, Dept. A8, 2106 Tucker Lane, Baltimore 7, Md.**

. . . **24-25—Product Maintainability Working Seminar, Sheraton Hotel, Philadelphia, Pa., sponsored by the Electronics Division, ASQC. Contact B. W. Marguglio, Martin Co., Mail No. 2000, Baltimore 3, Md.**

. . . **25**—Regional Technical Conference sponsored by the Kentuckiana section, Society of Plastics Engineers, Inc., on "Plastics in Major Household Appliances." The conference will be held in Monogram Hall of General Electric

1961 Shewhart Medal Nominations

Nominations are now being received by the Shewhart Medal Committee for consideration with respect to the Shewhart Medal Award for 1961. Previous Medalists are:

L. E. Simon	—1948	W. E. Deming	—1955
H. F. Dodge	—1949	M. E. Wescott	—1956
M. A. Brumbaugh	—1950	C. C. Craig	—1957
G. D. Edwards	—1951	I. W. Burr	—1958
E. L. Grant	—1952	P. S. Olmstead	—1959
H. G. Romig	—1953	E. R. Ott	—1960
E. G. Olds	—1954		

A letter of notification is being sent to all ASQC Section Chairmen. Any member of the Society is privileged to make a nomination for this honor. It is important, however, that any nomination be accompanied by suitable biographical and other information supporting the nomination so that the Committee will be able to give adequate consideration to the qualifications of the nominee.

Nominations may be forwarded to the Shewhart Medal Committee through the Chairman of the local Section, or they may be sent direct with supporting information to the Chairman of the Medal Committee, Rupert Gause, Bell Telephone Laboratories, Incorporated, 463 West Street, New York 14, New York. Nominations received by the Medal Committee on or before December 31, 1961 will receive consideration. Ten (10) copies of the letter of nomination and ten (10) copies of the supporting information will be needed for distribution to the Committee.

DO YOU HAVE A QUALITY CONTROL PRESENTATION PROBLEM?

QUALITY CONTROL AIDS ARE THE ANSWER

Make your presentation more forceful and understandable by the use of these aids.

QUINCUNX
. . . This device permits your audience to visualize the creation of a normal distribution pattern as well as the results of variables sampling. All beads are self-contained; nothing to drop out. Done in attractive mahogany complete with zipper carrying case.

ATTRIBUTE SAMPLING DEMONSTRATOR
Complete unit consists of transparent plastic container, opaque colored beads, and wood paddles permitting easy identification of beads at a distance.

SIMULTATORS
. . . To demonstrate control chart plotting and shift of distribution pattern.

Lightning Calculator Co.

Box 6192

St. Petersburg Beach 36, Fla.

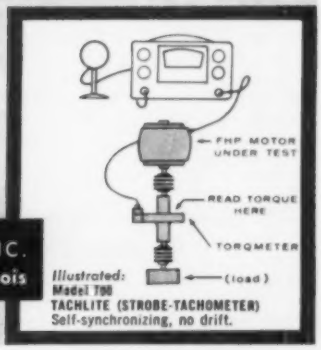
SENSITIVITY *UNEQUALED*

with FHP TORQMETERS

Illustrated:
Model 783 OZ-TORQMETER
measures from .05 to 80 oz.—inch
Also available:
Model 782 GRAM-TORQMETER
measures from .25 gm-cm to 100 gm-cm
Model 784 POUND-TORQMETER
measures up to 200 lb. — inch
Model 781 GRAM-TORQMETER
measures from .05 gm-cm to 5 gm-cm

For ACCURATELY MEASURING Rotating and Static TORQUES of FHP motors, gear-train efficiencies, ball bearings, servos, synchros, potentiometers, hair springs, and many other applications and devices.

We invite your inquiry for complete information and prices . . . or, send your specifications and application needs.



Illustrated:
Model T88
TACHLITE (STROBE-TACHOMETER)
Self-synchronizing, no drift.

POWER INSTRUMENTS, INC.
7352 North Lawndale Ave. • Skokie, Illinois

NOTE: A few choice territories available for experienced representation.

Co., Appliance Park, Louisville, Ky. The conference will cover virtually all aspects of the application of plastics in appliances from raw materials to inspection of finished parts. At 4:30 p.m., there will be a panel discussion on "Inspection Tests for Finished Parts," with J. V. Schmitz, General Electric Co., as moderator. Advance registration fee—eight dollars for SPE members and ten dollars for nonmembers. Contact H. G. Cooke, Jr., RETEC Registration Chairman, Jones Dabney Co., 1481 S. 11th St., Louisville, Ky.

. . . **25**—One Day Conference on Inspection of Steam Power and Nuclear Power Plant Components sponsored by the Utilities Committee, Society for Nondestructive Testing at COBO Convention Hall, Detroit, Mich. Contact Utilities Committee, Society for Nondestructive Testing, 1109 Hinman Avenue, Evanston, Ill.

. . . **25-26—Conference on Reliability Assurance Techniques for Semiconductor Specifications at the Department of Interior Auditorium, 18th and C Streets, N. W., Washington, D.C. sponsored by the Washington, D.C. section, ASQC; Semiconductor Devices Panel, Aerospace Industries Association; Engineering Department, Electronic Industries Association; Washington section, PGRQC, IRE, and Joint Electron Devices Engineering Council, with participation by the Department of Defense and the Air Force, Army and Navy. The conference is being held to discuss techniques for incorporating the recommendations of the PSMR (Darnell) Report in specifications for semiconductor devices and the cost implications associated with greater reliability assurance. The program will precede the annual Conference on Electron Devices sponsored by the IRE Professional Group on Electron Devices. Contact William H. von Aiven, ARINC Research Corp., 1700 K Street, N. W., Washington 6, D.C.**

. . . **25-27—15th New England Quality Control Conference, Statler Hilton Hotel, Hartford, Conn. Contact the registration chairman—John A. Sigmann, R. T. Vanderbilt Co., Inc., East Norwalk, Conn.**

. . . **25-28**—Electronics Division Meeting and 14th Pacific Coast Regional Meeting, American Ceramic Society, at the Jack Tar Hotel, San Francisco, Calif. Contact A. Cer. Soc., 4055 North High St., Columbus 14, Ohio.

. . . **26-27—29th Meeting of the ASQC Metals Technical Committee, Essex Inn, Chicago, Ill. Contact O. H. Bishop, Reynolds Metals Bldg., Richmond 18, Va.**

. . . **26-27—Two-day Training Program, University of Chicago, downtown campus, Chicago, Ill., contact Burten Persky, Teletype Corp., 5555 W. Touhy Ave., Skokie, Ill., Telephone OR 6-1000, Ext. 575.**

. . . **26-27—Annual Quality Control Conference, University of Alabama, Tuscaloosa, Ala. Contact E. T. Finnell, Jr., Engineering Extension Services, University of Alabama, Tuscaloosa, Ala.**

. . . **28—All Day Conference, Albright College, Reading, Pa., sponsored by the Reading subsection of the Allentown-Bethlehem section, ASQC, and the Reading chapter of the Society for Advancement of Management. Contact Joseph P. Napolitano, Jr., Carpenter Steel Co., 101 W. Bern St., Reading, Pa.**

. . . **28—All Day Quality Control Forum at Ecole Polytechnique sponsored by the Montreal section, ASQC. Contact Denys A. Pilon, Quality Control Chemist, Canada Packers Ltd., 1260 Mill Street, Montreal, Quebec, Canada.**

. . . **30-Nov. 4—Reliability Training Course sponsored by ASQC and IRE at the Sheraton Mount Royal Hotel, Montreal, Canada. The course, a number of which have been held throughout the USA, presents the theory, management and application of modern reliability techniques. The planned syllabus will be supplemented by guest speakers from various fields of reliability. Contact L. C. Thomas, Canadian Aviation Electronics Ltd., P.O. Box 2030, Montreal, Quebec, Canada.**

. . . **31-Nov. 10**—Basic QC course, University of Wisconsin, Madison, Wis. Contact Robert A. Ratner, 4020 Stadium, University Extension Division, University of Wisconsin, Madison 6, Wis.

NOVEMBER

. . . **4—Second Annual Rocky Mountain Empire Quality Control Clinic with the theme—Inspectioneering Workshop, Hotel Shirley Savoy, Denver, Colo. Contact Jerome F. Palmer, 6118 Jellison Way, Arvada, Colo.**

. . . **4—Fifth Annual QC Forum, McMaster University, Hamilton, Ontario, Canada, jointly sponsored by the Hamilton and University of Western Ontario ASQC sections. Contact Carman F. Cantlon, Canadian Westinghouse Ltd., Hamilton, Ontario, Canada.**

. . . **8-10**—First joint national meeting of the Operations Research Society of America and the Institute of Management Sciences, Jack Tar Hotel, San Francisco, Calif. The meeting will include sessions in three broad areas of Operations Research/Management Science. Tools of OR/MS, under the chairmanship of Professor George W. Brown, UCLA, will include mathematical programming, information processing, queuing models, and decision theory. Dr. Harold O. Davidson, Operations Research, Inc., is chairman for sessions on the applications of OR/MS, including management decision processes, problems in data and model validation, and case studies on military and non-military applications. The Challenge of OR/MS, chaired by Professor Gifford H. Symonds, Case Institute, will include use of OR/MS in the area of world peace, developments in organization theory, and general systems analysis. Both invited and contributed papers will be included in each session. Contact Peter H. Butterfield, Stanford Research Institute, Menlo Park, Calif.

. . . **9-10—Eleventh Annual Conference of the Aircraft and Missile Division, ASQC, Ambassador Hotel, Los Angeles, Calif., theme—Assuring Customer Satisfaction, four concurrent series of sessions on international and general interest, design—reliability, production—quality control, and field service—maintainability. Contact Hardy Harris, publicity chairman, c/o North American Aviation, Inc., International Airport, Los Angeles 45, Calif.**

QUALITY CONTROL

Engineers and Statisticians

National manufacturer of chemicals and allied products offers immediate opportunities to grow with an expanding organization.

Engineers should have knowledge and experience in analyzing customer specifications and developing Q.C. procedures. Gauging experience necessary.

Statistician and/or S. Q. C. applicants should have educational training in mathematics or S. Q. C. plus experience in the chemical or small components field. Work involves development and application of S. Q. C. techniques to diversified industry.

Excellent salary and fringe benefits. Relocation paid for by Atlas. Send salary requirements and resume to:

P. L. Flynn
Atlas Chemical Industries, Inc.
Wilmington 99, Delaware

All qualified applicants will receive consideration for employment without regard to race, creed, color or national origin.

Quality Control Engineers

EE Degree plus minimum
2 years' experience

Transitron Electronic Corp., New England's leading semiconductor manufacturer, has new and interesting positions offering broad and challenging responsibilities.

Salaries and company benefits are exceptionally liberal with unusual advancement opportunities. We will help you relocate to our fine suburban Boston community where an educational environment and individual accomplishments are traditional.

A letter or call to our Director of Technical Placement will be held in strictest confidence.

Transitron
electronic corporation
168 Albion St., Wakefield, Mass.
Phone: 245-4500

How to Transfer Your Section Affiliation

A number of members have asked how to go about transferring to a new ASQC section when they move.

Just drop a post card to the Society headquarters office in Milwaukee, indicating both your old and new address. Or if you have already moved and now wish to transfer to the section nearest your residence, indicate the section to which you now belong and the one into which you wish to transfer.

We will take it from there, correcting our records and notifying the secretaries of both sections for you.

Classified Advertising

Positions Wanted: ASQC Members $1.00, non-members $2.00 per line. Minimum space 5 lines, maximum 20 lines (2½ in. high).

Positions Available: $2.00 per line. Minimum 5 lines, maximum 20 lines. Box permissible if desired on maximum size. General advertising rates apply to all display sizes (1/6 page minimum).

35 characters and spaces per line.

Replies to box numbers and copy should be addressed to American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee 3, Wis. Deadline is 22nd of second month preceding publication.

POSITIONS AVAILABLE

QUALITY CONTROL MANAGER

Midwest manufacturer seeks man to initiate and direct quality control functions for medium size plant. Duties include inspection of components, final test and approval, establishment of methods and procedures and administration of complaints and returns. Statistical quality control knowledge and experience required. Electro-mechanical product experience and electrical engineering degree strongly preferred. Salary in area of $12,000. Please reply fully in complete confidence. Our employees know of this opening. Box 18R1.

QUALITY CONTROL ENGINEER

We need a Quality Control Engineer for the technical staff of our Quality Control Organization. Must have at least 2 years experience in quality control, preferably working with mass production of metal parts, with a B.S. Degree in Engineering. Work will involve process studies, capability analysis, test and inspection specifications. He should have workable knowledge of inspection equipment used for control. Send resume and salary requirements with snapshot to B. F. Frazer, American-Standard Plbg. & Htg. Div., 5801 Mariemont Ave., Cincinnati 27, Ohio.

Experience in final, sub-assembly and environmental testing; selection of test equipment; writing of test procedures for gyros and electromechanical components. Must also be capable of performing department administrative functions. Please submit resume or contact:

DAYSTROM INCORPORATED
Pacific Division
9320 Lincoln Boulevard
Los Angeles 45, California
SP 6-1700 OR 0-7260

SUPERVISOR OF QUALITY CONTROL ENGINEERING

Immediate opening for a Supervisor of Quality Control Engineering. He will institute a Statistical Quality Control program and be responsible for supervising process studies, capability analysis, test and inspection specifications. Product involves mass production of metal parts. Applicant should be a college graduate with at least 3 to 5 years experience, and must be capable of statistical analysis and design of experiment, some training and experience in supervision desirable. Send resumé and salary requirements with snapshot to B. F. Frazer, American-Standard, 5801 Mariemont Ave., Cincinnati 27, Ohio.

TRY US FIRST

Before you spend a lot of time looking for that new job with growth opportunity.

We can put your resume in the right places. Nation-wide coverage by the only agency specializing in quality and reliability. All fees paid by employers.

QUALITY CONTROL PERSONNEL SERVICE

267 Hawthorne St.
Malden, Mass.

Employer Job Listings Welcomed

AS PARAMETER TOLERANCES BECOME SMALLER THE NEEDS FOR QUALITY CONTROL BECOME GREATER!!

Simple theorem? Of course, but in its brevity this statement reveals a few of the things which are happening at Univac . . . and how they may affect your professional future if you are a Quality Control Engineer.

The Univac Quality Control Engineer has a new importance. He plays an essential role in virtually every department, and he is involved in programs from their initial design through the entire manufacturing cycle. Univac's rigid standards of reliability have created new needs for Quality Control Engineers who not only evaluate existing procedures, but also directly assist in the development of completely new manufacturing techniques.

As the tolerances on dimensional, electronic and environmental parameters become smaller, the needs for more and greater quality control increases. Recognizing this need, Univac has created new positions for engineers who are willing to accept the responsibilities of new programs and new challenges.

Your inquiry to the following positions will be given immediate and confidential attention. Salaries are liberally commensurate with experience. Univac pays your re-location expenses, and you start with customary employee benefits.

QUALITY CONTROL ENGINEERS
To develop and apply statistical quality control techniques, initiate and evaluate test and inspection procedures for the manufacture of superior quality products.

RELIABILITY ENGINEERS
To perform reliability analysis and predictions, develop failure reporting procedures, analyze failures and recommend corrective action.

Openings are at several levels of responsibility. Engineering or Science degree required, with a minimum of 2 years experience in electronics or related fields.

R. K. PATTERSON, Dept. A-10

Remington Rand Univac

DIVISION OF SPERRY RAND CORPORATION
2750 West 7th St., St. Paul 16, Minn.

(All qualified applicants will be considered regardless of race, creed, color or national origin)

The Author of One of These Articles from Volume XVII Will be Honored with the 1961 Brumbaugh Award

A Consolidated Decentralized Reliability and Quality Control Program Road to Understanding Eyeball in the Milk Bottle Linear Contrasts, Part I II III Quality Control and People Statistical Quality Control—The Cybernetic Approach to Business Operations An Extended Chain Sampling Inspection Plan A Vendor Rating System for Material of Any Complexity

Instrumental Quality Control for Color Starting a Control Chart, The Effect of Number And Size of Samples on the Level of Significance at the Start of a Control Chart for Sample Means The Role of Quality Assurance in Product Reliability, Part I II A Nomogram for Upper Confidence Limits to Percent Defective Cost of Reliability A $2,000,000,000 Quality Operation

Consolidated Rating System O-C Curves for ChSP-1 Chain Sampling Plans Tolerance Limits Based on Life Test Data Taken from an Exponential Distribution Automation and Quality Control Acceptance Sampling Demonstration With a Bead Box A Graphical Method for Determining the Effect of the Isolated Factor on the Total Span in the Span Plan Analysis Build a Quality Team

A Decentralized Team Approach to Quality and Reliability The Role of Quality Control as Moderator of Applied Science in the Corporation Modern Quality Control Pays Off in Woodwork SQC vs. Intuitive Inspection The Legal Framework for Inspection Under Government Contracts Sampling Plans for Determining Compliance with Electronic Parts Reliability Requirements

Distribution of the Range and Midrange When Sampling from a Negatively Skewed, Right-Triangle Population Lot Acceptance Sampling by Variables Using the Median and Quasi-Range Conducting In-Plant Training Sessions in Statistics Applications of Industrial Statistics in Research and Development A Mixed Model Factorial Experiment in Testing Electrical Connectors

Quality Control from Front Door to Back Door Are Statistical Life-Testing Procedures Robust? Intercomparison of Laboratory Test Methods Critique of Vendor Quality Rating Systems Training for Statisticians—Industry's Need Quality Control Programs Should Be Cost Reduction Programs Quality Control in the Construction Industry A Six-Step Quality Control Program

Management Development Through Quality Control Statistical Quality Control Applications in the Food Industry Total Quality Control Through Reliability Reliability of Guided Missiles The Basic Work Elements of Quality Control Engineering Developing Quality Consciousness A New Graph for Determining CSP-1 Sampling Plans Presentation of Reliability Information

Mechanization, Quality Control, and Automation Life Test—Some Practical Considerations Selection of Flavor Panels for Complex Flavor Differences Reliability: Why Is It Needed? Automatic Production Recording—Yield—And Quality Control Some Comments on the Semantics of Quality and Reliability Examples of Designed Experiments Primer on Experimentation

The Management of Reliability Programs Operationalism in Quality Control Quality in the Automotive Industry Modern Inspection Techniques and Automation Reliability Procurement Data Fun—Data Frustration—Data Failure Management Policies for Assigning Departmental Reliability Responsibilities The Experiment, the Design, the Analysis

The Brumbaugh award is presented to the author of the best article in each volume of *Industrial Quality Control*. This year the selection is being made for the articles in Volume XVII, July 1960 through June 1961. You can aid in the selection of the best article by sending your nomination now to the Brumbaugh Award Committee.

----------SEND YOUR NOMINATION TODAY TO----------

Mr. Cuyler J. Hawkes, Chairman, Brumbaugh Award Committee
Rm. 6185 Plankinton Building, 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin

To give recognition to the most deserving article in IQC, July 1960 through June 1961, I nominate:

.....
TITLE

.....
AUTHOR

----------Deadline Date November 1, 1961----------

. . . **10—Sixth Annual All Day Conference on Quality Control and Reliability, Hotel Pick Carter, Cleveland, Ohio, sponsored by the Cleveland section, ASQC. Contact Donald S. Leckie, Republic Steel Corp., 1517 Republic Bldg., Cleveland, Ohio.**

. . . **13-15**—Third Annual Seminar on Color Control for the Graphic Industries, Rochester Institute of Technology, Rochester, N.Y. Topics will include physics of color, color vision, illumination, purchasing, color control, and techniques for color measurement. Speakers will include Dr. Henry A. Knoll, head, Ophthalmic Lens Product Development and Instrument Research; Dr. Robert J. Meltzer, head, Advanced Development Department, Bausch & Lomb, Inc.; S. H. Philpot, senior engineer, Packaging Section, Coca Cola Co.; Warren L. Rhodes, director, Graphic Arts Research Department, Rochester Institute of Technology, and Francis L. Wurzburg, Jr., Printing Ink Division, Interchemical Corp. Contact Harold M. Kentner, director, Extended Services Division, Rochester Institute of Technology, Rochester 8, N.Y.

. . . **13-15**—Technical and Operating Conference of Steel Founders' Society of America, Hotel Carter, Cleveland, Ohio. Contact Chal Adams, the Bayless-Kerr Co., Hanna Bldg., Cleveland 15, Ohio.

. . . **14**—Symposium on Electronic Systems Reliability, Linda Hall Library Auditorium, 5109 Cherry St., Kansas City, Mo. It will be sponsored by the Kansas City section, IRE. Contact Arthur Goldsmith, Wilcox Electric, Kansas City, Mo.

. . . **17—Quality Control Conference, Hotel Burlington, Burlington, Ia., sponsored by the State University of Iowa section, ASQC. Contact G. J. Narigon, Iowa State Industries, Box 316, Fort Madison, Ia.**

. . . **17-18—EVOP course jointly sponsored by the Chemical Division and Food and Allied Industries Division, ASQC. Contact Horace Andrews, Swift & Co., 400 E. 33rd St., Chicago 15, Illinois.**

DECEMBER

. . . **2-5**—International Visual Communications Congress, Biltmore Hotel, Los Angeles, Calif., sponsored by the Society of Reproduction Engineers, American Institute for Design and Drafting, and (for the first time) the American Records Management Association. Contact Sedan Associates, 18465 James Couzens Hwy., Detroit 35, Mich.

. . . **12-14**—Eastern Joint Computer Conference, Washington, D.C., sponsored by AFIPS, the American Federation of Information Processing Sciences, comprising the Institute of Radio Engineers, American Institute of Electrical Engineers and the Association for Computing Machinery. Theme—Computers—Key to Total Systems Control. Contact Samuel E. Stavisky & Associates, Inc., 801 19th Street, N. W., Washington 6, D.C.

JANUARY

. . . **9—Short Course in Quality Control Jan. 9 to Apr. 3, University of Nebraska Medical Campus, Omaha, Nebr., sponsored by the Omaha-Lincoln section, ASQC, and the Extension Division, University of Nebraska. Contact Niles H. Barnard, 203 Richards Hall, University of Nebraska, Lincoln 8, Nebr.**

. . . **9-11—Eighth National Symposium on Reliability and Quality Control, Statler-Hilton Hotel, Washington, D. C., sponsored by ASQC, IRE, EIA and AIEE. Contact A. R. Park, Mail Stop 729, Westinghouse Electric Corp., P. O. Box 1897, Baltimore 3, Md.**

. . . **27—Eleventh Annual All Day Conference, Sinton Hotel, Cincinnati, Ohio. Contact Don Fleischel, 2288 Deblin Drive, Cincinnati 32, Ohio.**

. . . **27—Sixth Annual Inland Empire Quality Control Conference, California State Polytechnic College, Kellogg Campus, Pomona, Calif. Contact S. Roy Wood, 1305 S. Rimsdale Drive, West Covina, Calif.**

. . . **29-Feb. 2**—Measurement Engineering Short Courses at Arizona State University. Theme—How to Obtain Valid Data on Purpose. Speakers will include Dr. Kurt S. Lion, MIT, Cambridge, Mass.; Robert J. Moffatt, General Motors Research Laboratories, Warren, Mich.; R. N. Motsinger, Motorola Research Laboratory, Phoenix, Ariz.; Dr. Bernard Ostle, Arizona State University, Tempe, Ariz.; Peter K. Stein, Arizona State University, editor—"Strain Gage Readings," Phoenix, Ariz.; L. Spencer Wirt, Aireserach Manufacturing Division, Garrett Corp., Phoenix, Ariz., and Glenn Dickson, Arizona State University, Tempe, Ariz. Registration closes Jan. 19, 1962. Contact Professor Peter K. Stein, Engineering Center, Arizona State University, Tempe, Ariz. Fees for the programs are $200 for the lecture program and $125 for the experimental program.

. . . **30-Feb. 2**—18th Annual Technical Conference, Society of Plastics Engineers, Penn-Sheraton Hotel, Pittsburgh, Pa. Contact SPE, 65 Prospect Street, Stamford, Conn.

FEBRUARY

. . . **7-9**—National Winter Convention on Military Electronics, Ambassador Hotel, Los Angeles, Calif., sponsored by the Institute of Radio Engineers. The keynote of this important national meeting will be established by a panel of the Assistant Secretaries of the Armed Services (R&D) moderated by the Honorable John H. Rubel, Assistant Secretary of Defense, Deputy Director of Defense Research and Engineering. Contact Matthew E. Brady, chairman, Technical Program Committee, Institute of Radio Engineers, Inc., 1 East 79th St., New York 21, N.Y.

. . . **18-22**—47th Annual Meeting, Technical Association of the Pulp and Paper Industry, Commodore Hotel, New York City. Contact TAPPI, 360 Lexington Ave., New York 17, N.Y.

. . . **26-Mar. 2**—Quality Control Course, American Management Association Academy, Saranac Lake, N.Y., a one-week course covering areas of tools for quality control, planning, organization for effective quality control, objectives and scope of the function, measuring quality control effectiveness, developing the attitude, and relation of quality control to the over-all organization. Contact AMA registrar, American Management Association, 1515 Broadway, New York 36, N.Y.

MARCH

. . . **5-9**—Thirteenth Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy sponsored by the Analytical Chemistry Group of the Pittsburgh Section of the American Chemical Society and the Spectroscopy Society of Pittsburgh. It will be held at the Penn-Sheraton Hotel, Pittsburgh, Pa. The absolute deadline for receipt of abstracts for papers is Oct. 16, 1961. For paper requirements and conference information, contact Dr. C. F. Glick, program chairman, The Pittsburgh Conference, Applied Research Laboratory, United States Steel Corp., Monroeville, Pa.

. . . **8-9—Middle Atlantic Conference, ASQC, Statler-Hilton Hotel, Washington, D.C. Contact Gilbert L. Maton, John I. Thompson & Co., 1118 22nd St., N. W., Washington 7, D.C.**

. . . **10-13**—International Watchmakers and Mechanical Instrumentation Congress, Hotel Commodore, New York City, sponsored by the American Watchmakers Institute, a national technical society. The Congress is designed for and devoted exclusively to micro-instrumentation and the scientific and technical advancements in the measurement of time. A tentative program has been established under the interest areas of electro-mechanisms, timing instrumentation, and micro-miniaturization. Technical sessions will be held during the morning hours. Contact Carl G. Sedan, executive director, American Watchmakers Institute, 18465 James Couzens Highway, Detroit 35, Michigan.

. . . **12-13**—Annual Meeting of Steel Founders' Society of America, Drake Hotel, Chicago, Ill. Contact Chal Adams, the Bayless-Kerr Co., Hanna Bldg., Cleveland 15, Ohio.

ASQC Institute
2nd
Quality Engineering
Course
November
6-10
1961
Hotel Thayer
West Point, N.Y.

ASQC
161 W. Wisconsin Ave.
Milwaukee 3, Wis.

Please enroll me in the 2nd Quality Engineering Course. Enclosed is check for $150 Registration fee.

Name

Title

Company

Address

. . . 17—Annual Quality Control Seminar sponsored by the Southern Connecticut section, ASQC, in conjunction with the University of Bridgeport, Bridgeport, Conn. Contact Theodore H. Reuther, Bryant Electric Co., Box D, Barnum Station, Bridgeport, Conn.

. . . 24—Seventh Annual Quality Control Symposium, Dan Rogers Hall, Texas Christian University, sponsored by the Dallas-Fort Worth section, ASQC. Contact Mark R. Seldon, 810 Cedar Hill, Dallas, Texas.

. . . 27—Rochester Quality Control Conference, University of Rochester, Rochester, N. Y., sponsored by the Rochester section, ASQC. Contact Wilbur C. Myers, Delco Appliance Division, General Motors Corp., 391 Lyell Ave., Rochester, N.Y.

. . . 29-30—Conference, Administrative Applications Division, ASQC, at the Ecole Polytechnique, University of Montreal, Montreal, Quebec, Canada. Contact J. B. Pringle, Bell Telephone Company of Canada, 1050 Beaver Hall Hill, Montreal 1, Quebec, Canada.

APRIL

. . . 11-13—Technical Meeting and Equipment Exposition of the Institute of Environmental Sciences, Sheraton Hotel, Chicago, Ill. Contact H. F. Sander, executive secretary, P. O. Box 191, Mount Prospect, Ill.

. . . 14—Second Annual Forum, Toledo section, ASQC, Hillcrest Hotel, Toledo, Ohio, sponsored by the Toledo section, ASQC. Contact T. R. Meyer, Owens-Illinois Glass Co., Box 1035, Toledo 1, Ohio.

. . . 27-28—Quality Control Conference, Hotel Anthes, Fort Madison, Ia., sponsored by the State University of Iowa section, ASQC. Contact G. J. Narigon, Iowa State Industries, Box 316, Fort Madison, Ia.

MAY

. . . 4-5—Northwest Quality Control Conference, Portland, Ore., sponsored by the Portland section, ASQC. Contact Donald E. Hancock, c/o Jantzen, Inc., 411 N. E. 19th Ave., Portland, Ore.

. . . 8-10—Twelfth Annual Electronics Components Conference, Marriott Twin Bridges Hotel, Washington, D.C. It will be sponsored by AIEE, EIA, IRE, with participation by ASQC and the Society for Non-Destructive Testing. This conference is devoted to new developments in components, component processing techniques, component evaluation and component materials. Authors may submit a 500-word summary before Oct. 9. To expedite prompt handling, 15 copies are requested. Authors will be notified of acceptance about Nov. 15. Final papers are due Jan. 15, and will be published in the Conference Proceedings. Contact Henry A. Stone, Bell Telephone Laboratories, Murray Hill, N.J.

. . . 23-25—ASQC Sixteenth Annual Convention and Exhibit, Netherland-Hilton Hotel, Cincinnati, Ohio. Contact William P. Youngclaus, Jr., ASQC, 161 W. Wisconsin Ave., Milwaukee 3, Wis.

JUNE

. . . 27-29—Joint Automatic Control Conference, New York University, New York City, sponsored by PGAC, AIEE, ISA, ASME, and AICHE. Contact Dr. H. J. Hornfeck, Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.

AUGUST

. . . 16-18—Western Regional Conference, ASQC, Benjamin Franklin Hotel, Seattle, Wash. Contact Norman W. Steele, 607 N. 62nd St., Seattle 3, Wash.

ASQC Annual Convention

Future Dates

May 23-25, 1962	Cincinnati
May 20-22, 1963	Chicago
May 4-8, 1964	Buffalo
May 4-8, 1965	Los Angeles
June 1-3 1966	New York

CONSULTING SERVICES

Responsibility of the American Society for Quality Control, Inc., for Consulting Services advertising is limited to certification that advertisers hold the grade of membership in the Society stated in their advertisements. Qualification requirements for the several grades of memberships are set forth in the Constitution of the Society. Business card ads are available only to members of the Society—12 insertions $100.00; 6 insertions $65.00.

QC Planning Defect Prevention
LEONARD A. SEDER
FELLOW ASQC
267 HAWTHORNE ST.
MALDEN MASS.
DAvenport 4-5446
Organizing for Quality Training

Quality Control Consultant
HARMON S. BAYER
Fellow, ASQC
1154 Book Building Telephone
Detroit 26, Michigan WOodward 5-3796

Management Controls
FOUNDED IN 1948
References and Literature on Request
Senior Partner: 899 Rose Ave.
W. E. JONES Des Plaines, Ill.
Fellow, ASQC *Vanderbilt 4-1317*

WYdown 3-2234
JOSEPH MOVSHIN
Fellow ASQC
Management Service To Supplement Your Staff
9220 Old Bonhomme Rd. St. Louis 32, Mo.

HUnter 7-5747
THOMAS A. BUDNE
Fellow ASQC
QUALITY CONTROL • RELIABILITY
STATISTICAL ENGINEERING
3 DUNSTER ROAD, GREAT NECK, N. Y.

VENDOR SURVEYS-INSPECTION
A National Organization with Engineers in Nine Key Centers Coast to Coast.
Write for Schedule of Fees
R. CALVERT HAWS, Member, ASQC
QUALITY CONTROL ENGINEERS, INC.
6399 Wilshire Blvd., Los Angeles 48, Calif.

R.R. 3, Box 158
Greenwood, Indiana
SUTHERLAND-JACOBSON & ASSOCIATES
Consultants in Quality Control
Inspection Procedures, Process Controls, Statistics for Research and Development
M. L. SUTHERLAND, Ph D., Fellow ASQC
H. J. JACOBSON, Fellow ASQC

BERNARD HECHT
Fellow, ASQC
Planning and Staffing Q. C. Organizations
Quality Improvement Programs
Reliability Training and Indoctrination
5455 Wilshire Blvd. Telephone:
Los Angeles 36, Calif. WEbster 8-5271

EDWARD A. REYNOLDS
Fellow, ASQC
LIGONIER, PA.

Consulting Services in Quality Control
Since 1945
RALPH E. WAREHAM
Fellow, ASQC
122 Orchard Ridge Telephone
Chappaqua, New York CEntral 8-3715

FRANK H. SQUIRES
Fellow, ASQC
Consultation
Reliability Organization
Quality Control System 4700 Crenshaw Blvd.
Cost Control Los Angeles 43, Calif.
Surveys, Training AXminster 1-3213

Training Programs
Consultant to Consultants
STATISTICAL ENGINEERING INSTITUTE
F. E. SATTERTHWAITE, DIRECTOR
Fellow, ASQC
8 Fuller Road
Wellesley 81, Mass. CEdar 5-6335

Product Education Service

These advertisers provide educational information on their products expanding the services of your journal, *Industrial Quality Control.*

When writing or talking to advertisers to inquire about their products always remember to say you saw their ad in *Industrial Quality Control.*

Advertisers in This Issue

Key Number		Page
	Atlas Chemical	52
A-50	Brown & Sharpe	34-35
A-5	Comtor Co.	43
A-9	Elliott Service Co.	OBC
	IBM Corp.	45
A-11	Jones & Lamson	IFC
A-69	King Tester Corp.	49
A-13	Lightning Calculator	51
	Lockheed Missiles	31
A-12	Lufkin Rule Co.	43
A-65	Nikon, Inc.	IBC
A-70	Power Instruments, Inc.	51
	QC Personnel Service	53
	Remington Rand Univac	53
A-58	Rex Gauge Co.	47
A-18	Sheffield Corp.	43
A-62	J. T. Slocomb Co.	40
A-53	P. A. Sturtevant Co.	49
	Transitron Electronic	52
A-76	Vinco Div., Vinco Corp.	19
A-66	Waldes Kohinoor, Inc.	41
A-21	Carl Zeiss, Inc.	1

Advertisers in Previous Issues of Volume XVIII

Atlantic Research Corp.
Bell Telephone Laboratories
Cadillac Gage Co.
Carborundum Co.
Celanese Fibers Co.
Coulter Electronics, Inc.
Davidson Optronics
Greater Muskegon Section, ASQC
W. G. Haddrell
Howe Services
Martin-Decker
Monroe Calculating Machine Co.
Optical Gaging Products
Packard Bell Electronics
Process Simulation & Analysis
QC Engineers
Richmont, Inc.
Testing Machines, Inc.
Unit Process Assemblies, Inc.

Mail the post card at right to obtain further information about any of the items appearing in advertisements or new products and new literature described in the "What's New" department, pages 18-22.

Att: Product Education Service, 10-61
Please type or print the key number of advertisements, new products, or new literature.

ADVERTISERS — NEW PRODUCTS AND LITERATURE

4—_____ _____
4—_____ _____
4—_____ _____
4—_____ _____

Name_____

Position_____

Company Address_____

_____

City_____ Zone No._____ State_____

(This Card Is Not Valid after Dec. 31, 1961)

Place
3¢
Stamp
Here

INDUSTRIAL QUALITY CONTROL
6185 Plankinton Building
161 W. Wisconsin Ave.
Milwaukee 3, Wis.

PRODUCT EDUCATION SERVICE NO. A-65

NIKON OPTICAL COMPARATOR

new model 3A offers unusual screen brightness and image resolution – features zoom-condenser system

The unusual image brightness, definition and accuracy achieved in the new model 3A–to the very edge of the screen –is a credit to the quality and design of its optical system.

The new Nikon model 3A permits surface as well as contour inspection–independently or simultaneously. And controls are provided for adjusting the intensity of each of the illuminators.

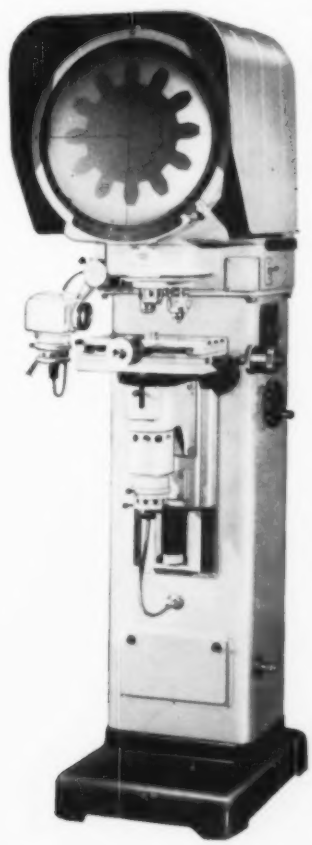
The surface illuminator may be used obliquely to emphasize surface texture. Or, for greater measurement accuracy, the surface illuminator may be used in conjunction with lens-mounted, half-reflecting 45° angle mirrors to provide shadowless light on the optical axis. Contour illuminator employs a special zoom condenser matching system. Convenient control simplifies adjustment for optimum illumination at each magnification.

Model 3A is normally supplied with a choice of one or more standard lenses in magnifications ranging from 10x to 100x. Other magnifications are also available on special order. A 3-lens turret supplied as standard equipment, facilitates instant changes. Focusing is smooth and effortless. Utilizes leadscrew drive with scraped ways and adjustable gibs.

The model 3A is equipped with a sliding hood which may be drawn out to shade the screen, or can be retracted to permit ready access to chart or screen surface. The overall diameter of the screen glass is 14½", designed for use with standard charts.

The new Nikon 3A accepts a wide variety of micrometer stages, holding fixtures, protractor screens, charts, photo attachments, and other accessories. For details write to Dept. IQ-10.

features new 14" screen



NIKON INCORPORATED Instrument Division 111 Fifth Avenue New York 3, N. Y.

Makers of optical inspection instruments, scientific and industrial microscopes, surveying instruments, cameras, telescopes, binoculars and other precision optical equipment.

are your employees QUALITY-deaf?

Does the work-level listen to everything but hear nothing when it comes to your Quality messages?

If employee indifference and the difficulty of personal coverage in problem areas is of growing concern to you, then you will want to investigate the Elliott Hi-Vision Quality Program.

Here is a well conceived, practical approach to securing employee cooperation on a plant-wide basis.

Details and colorful samples of this effective, low cost means of moving minds in the right direction are yours on request.

See for yourself how other A.S.Q.C. members are solving the employee apathy problem.

ELLIOTT SERVICE COMPANY, INC.
Department 10, Mount Vernon, N. Y.

Please provide me, without obligation, further information and multi-color samples of your Hi-Vision Quality Program.

Name .....

Title .....

Firm .....

Address .....

City ..... Zone ..... State .....

ELLIOTT SERVICE COMPANY, INC.

MOUNT VERNON, NEW YORK